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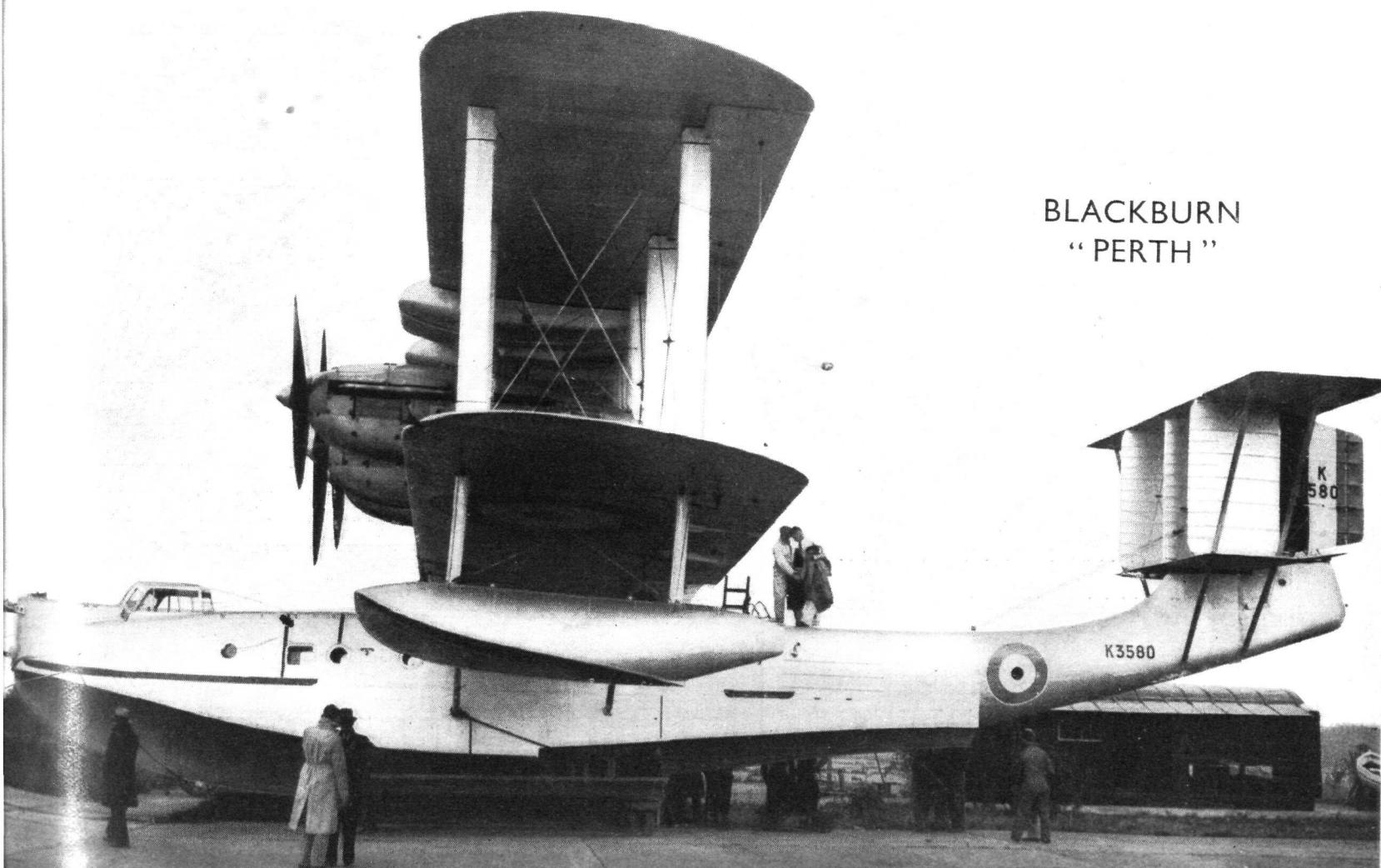
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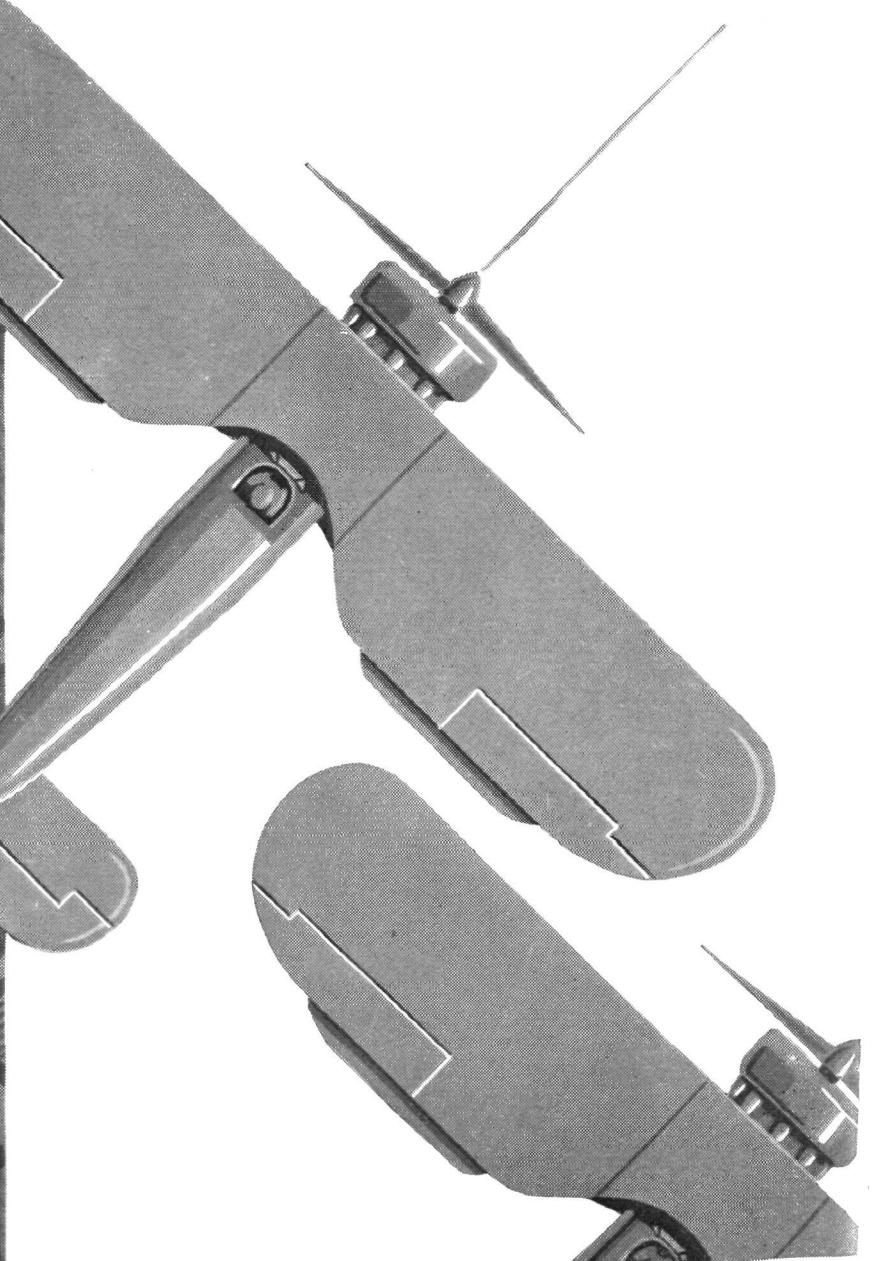
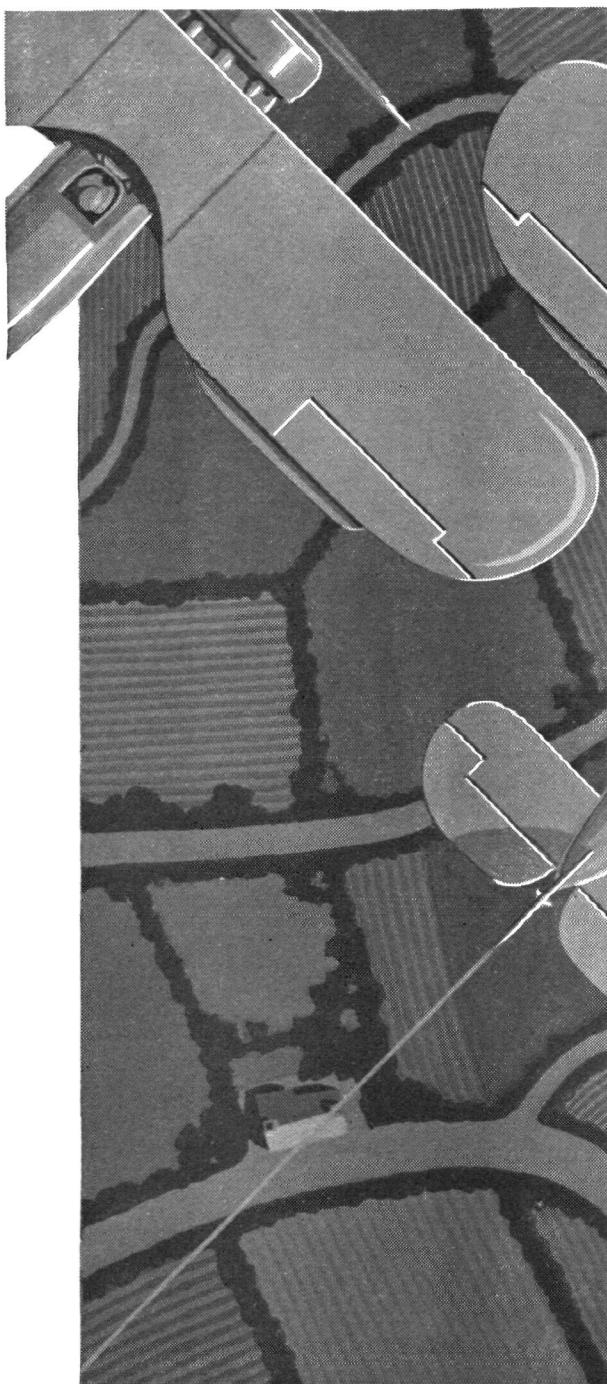
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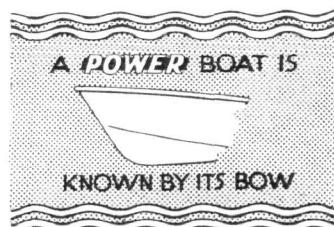


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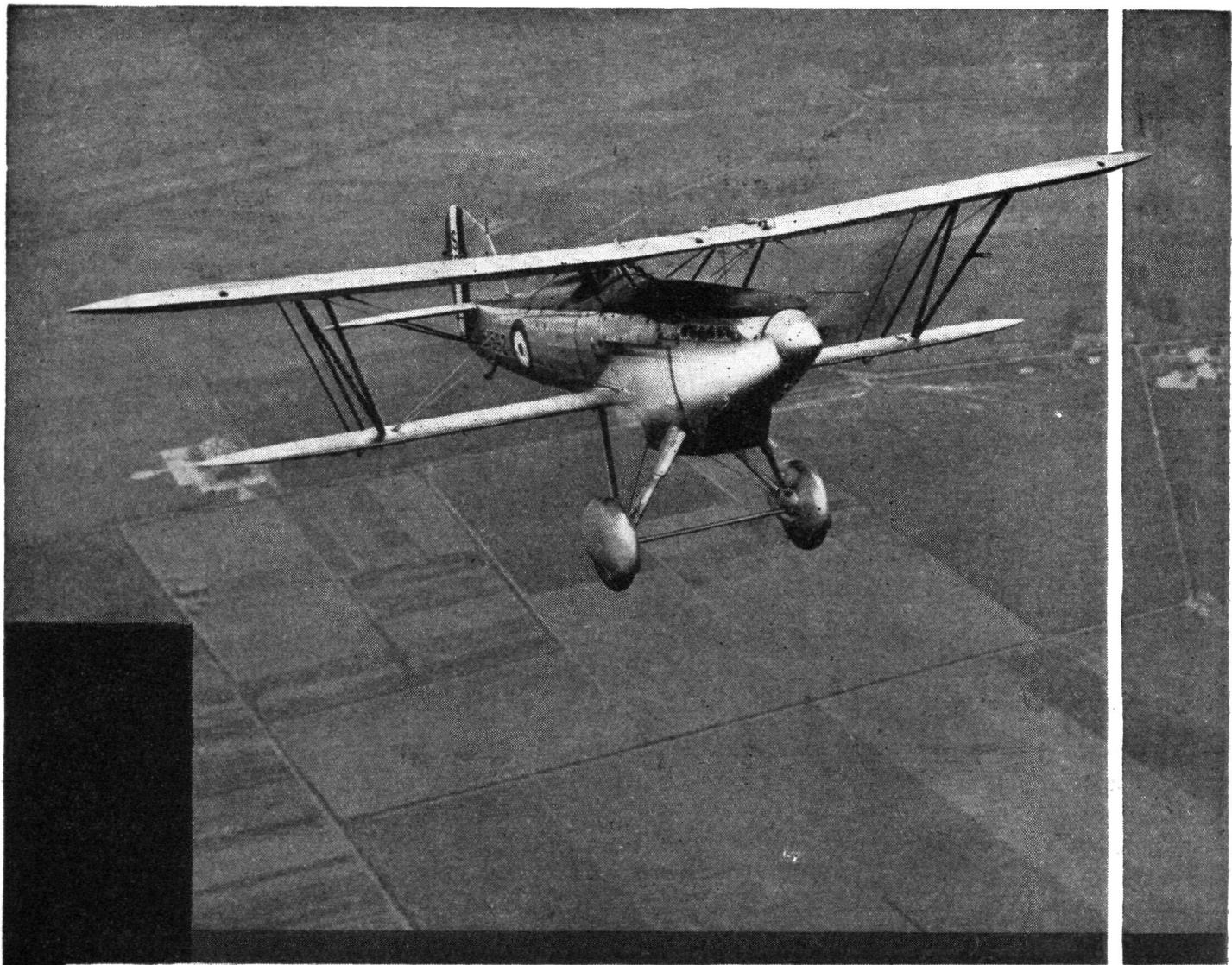
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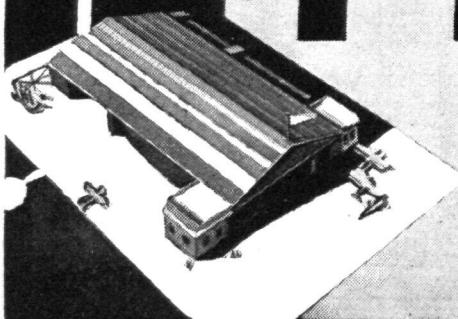
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# FLIGHT

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First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

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## CONTENTS

Editorial Comment:	PAGE
The Marvellous Macchi	1063
A New Australian Record	1064
Portugal and France	1064
Handley Page "Heyford"	1065
To Australia in Under 7 Days	1066
The Short Monoplane	1068
From the Clubs	1069
1934 International Touring Competition	1072
THE AIRCRAFT ENGINEER	1072A
Air Transport: Tasmanian Air Services	1073
Airport News	1075
Airisms from the Four Winds	1076
South African Enterprise	1078
The Farman 390	1079
Correspondence	1080
Esavian Hangar Doors	1082
Royal Air Force	1083
Aircraft Companies' Stocks and Shares	1084
Imports and Exports	1084

## DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1933.

- Oct. 27. Hull Ae.C. Annual Ball, at Beverley Road Baths, Hull.
- Oct. 27-28. Lamport Hall Club "Concours d'Elegance," Sywell Aerodrome.
- Oct. 28. Yarmouth Reunion at Cafe Royal.
- Nov. 2. Air Command, Legion of Frontiersmen, Gen. Meeting and Dinner at Hambone Club, Gt. Windmill St., W.C.
- Nov. 2. "The Practical Side of Motorless Flight." Lecture by S. Humphries before Imperial College Gliding Club, S. Kensington.
- Nov. 2. "Variable-Pitch Airscrew and Variable Gears," Lecture by W. G. Jennings before R.Ae.S.
- Nov. 3. Norfolk and Norwich Aero Club Annual Ball, at Thatched Assembly Rooms, Norwich.
- Nov. 16. Herts and Essex Ae.C. Annual Dinner and Dance, Wharncliffe Rooms, Hotel Gt. Central, London.
- Nov. 16. "Stiffness of Aeroplane Wings." Lecture by H. Roxbee Cox before R.Ae.S.
- Nov. 24. Yorkshire Ae.C. Annual Dance, Hotel Majestic, Harrogate.
- Nov. 25. Comrades of the R.A.F. Reunion Dinner, at Thames House Restaurant, Millbank, S.W.1.
- Nov. 30. "Tail Buffeting." Lecture by Dr. W. J. Duncan before R.Ae.S.
- Dec. 1. No. 3 Sqdn. R.F.C. and R.A.F. Reunion Dinner, at May Fair Hotel.
- Dec. 1. No. 70 Sqdn., R.A.F., Reunion Dinner, at R.A.F. Club, Piccadilly.
- Dec. 1. Lancashire Ae.C. Annual Ball, Midland Hotel, Manchester.
- Dec. 1. Hampshire Ae.C. Annual Dinner and Dance, South Western Hotel, Southampton.

## EDITORIAL COMMENT



E can only express amazed admiration at the third speed record established by the Macchi-Fiat combination. When Warrant Officer (now Lieutenant) Francesco Agello beat Flt. Lt. Stainforth's high speed record over a straight course of three kilometres, we admired, but we were not particularly surprised. It seemed to be only in the natural course of events that a machine specially built to cover three and a-half kilometres four times or so should

The Marvellous Macchi be able to outfly a machine which had been designed to stay the Schneider course of 350 kilomètres. Once the designer can cut down the petrol tankage, many things follow which make it easy to attain a higher speed for a short time. It was a consoling thought, but our consolation has been rudely shaken.

The next happening was that Col. Guglielmo Cassinelli beat Flt. Lt. Boothman's record for 100 kilometres in a closed circuit, and, if the reports are correct, he used the same Macchi-Fiat which had been used by Agello over the three kilometres course. That called for considerably more fuel.

Now Capt. Scapinelli, also using the same machine, has won the Blériot Cup by flying for half an hour, and covering over 192 miles. We may presume that this 2,800-h.p. Fiat uses at least 200 gallons of petrol an hour, and so 100 gallons must have been carried on this flight. The photograph of the machine which we published last week shows that the floats used on the 100 kilometres flight are not diminutive, and could contain a considerable amount of fuel, though we have no information as to whether smaller floats were used for the original three kilometres record and were changed afterwards for more commodious ones. At any rate the latest flight of half an hour definitely takes the machine out of the class of what may be called short-spurt freaks.

It may be useful to show the speeds of the three record flights in tabular form:—

Agello, 3 kms. run four times, 682.403 k.p.h., 423.76 m.p.h.	629.37	391
Cassinelli, 100 kms.	619.374	385.057
Scapinelli, 30 mins.		

The Blériot Cup was presented by M. Blériot in 1931 after the Schneider Trophy was won outright by Great Britain, in order that the world should not be left without a stimulus to high-speed research and effort. The minimum qualification for winning this Cup temporarily is to fly for half-an-hour at a speed of 600 kilometres an hour, and the pilot who does that holds the Cup until his speed is beaten by 5 per cent. To win the Cup outright, a pilot must travel at 1,000 k.p.m. for half-an-hour. Capt. Scapinelli is the first man who has qualified to hold the Cup.

The details of the competition have not been made very clear. In this case, Scapinelli flew from Porto Corsino, just north of Ravenna, to Porto Recanati, a few miles south of Ancona, which is a distance of about 100 miles. Presumably he must have made one turn at the southern point and flown back northwards. This turn of 360 deg. would reduce his average speed by quite a good amount. We have not been informed whether it is permitted to fly for the full half-hour in one straight line; presumably that is not the case, or else Scapinelli would have done so. To permit straight-line flying would be the best way to encourage the production of a pure speed-machine, which was what M. Blériot must have wished to do. However, the fact remains that a seaplane, which could achieve  $423\frac{3}{4}$  m.p.h. in a short straight run, has now flown for half-an-hour at a speed of 385 m.p.h., and has covered 192 miles. It is a positively amazing performance, and we offer our very best congratulations to Italy for possessing such fine designers and such fine pilots. We look forward to the time when we shall again enter into sporting rivalry with the Italians.

❖ ❖ ❖ ❖

Honorary Flight Lieutenant Charles Ulm has lowered the time for a flight to Australia to under a week, and, if his "Whirlwind" engines had behaved themselves better, and if some aerodromes

**A New Australian Record** had not been too wet for the take-off of the large Avro 10, he would doubtless have made the time even lower than that. The talk in many daily

papers about a race to beat the time of Kingsford Smith was as irrational as was the talk in 1929 when Kingsford Smith and Ulm and two others in the *Southern Cross* were said to have "beaten" Hinkler's record. At a luncheon at Australia House, Mr. Ulm himself protested against the comparison, pointing out that Hinkler had to be his own pilot, navigator, and engineer, and that he had no wireless, whereas on the well-equipped *Southern Cross* there were two pilots, and all duties were divided up. The Avro 10, *Faith in Australia*, is very similar to the *Southern Cross* (she is, in fact, the old *Southern Moon*, which belonged to Australian National Airways, and she was reconditioned and modified by Mr. Wackett), and she carried a crew of four. This time Kingsford Smith was flying solo, so that, again, no comparison should be made. In fact, considering all the advantages which the Avro 10 possessed, it would have been more satisfactory if she had beaten the "Gull" by more than she actually did.

Under a week to Australia is, however, a timing which it is not unpleasing to contemplate. There

is something businesslike about this flight with full equipment and division of duties. It sets a standard for the future in a way which solo flights cannot do. The more meritorious a solo flight, the less practical is it as a criterion of what a commercial service ought to be able to accomplish on its regular schedule. With machines which have a higher cruising speed than the *Faith in Australia*, which cannot be called a recent design, a week ought not to be too fast a time for a passenger service. Mails must be carried very much faster than that.

❖ ❖ ❖ ❖

The contract giving concessions to a French operating company known as S.P.E.L.A. in Portuguese territory has recently been cancelled, or has not been renewed, owing apparently to a failure to

**Portugal and France** make a deposit in the time stipulated.

French French monopoly of the Azores as an air port. The monopoly rights were not exercised for any commercial purpose, but it is none the less satisfactory that they have now come to an end. Their existence made it necessary for Great Britain to take steps to guard her own rights in the Bermudas so as to have something to bargain with if a scheme for a service across the Atlantic were to eventuate. In any case these provisions looked far ahead, for as yet we have no form of aircraft which could carry a pay load to the Azores. Flying boat development is, however, proceeding fairly energetically in this country, and it would be pessimistic to say that we shall never have a craft which can carry a pay load in addition to its own fuel.

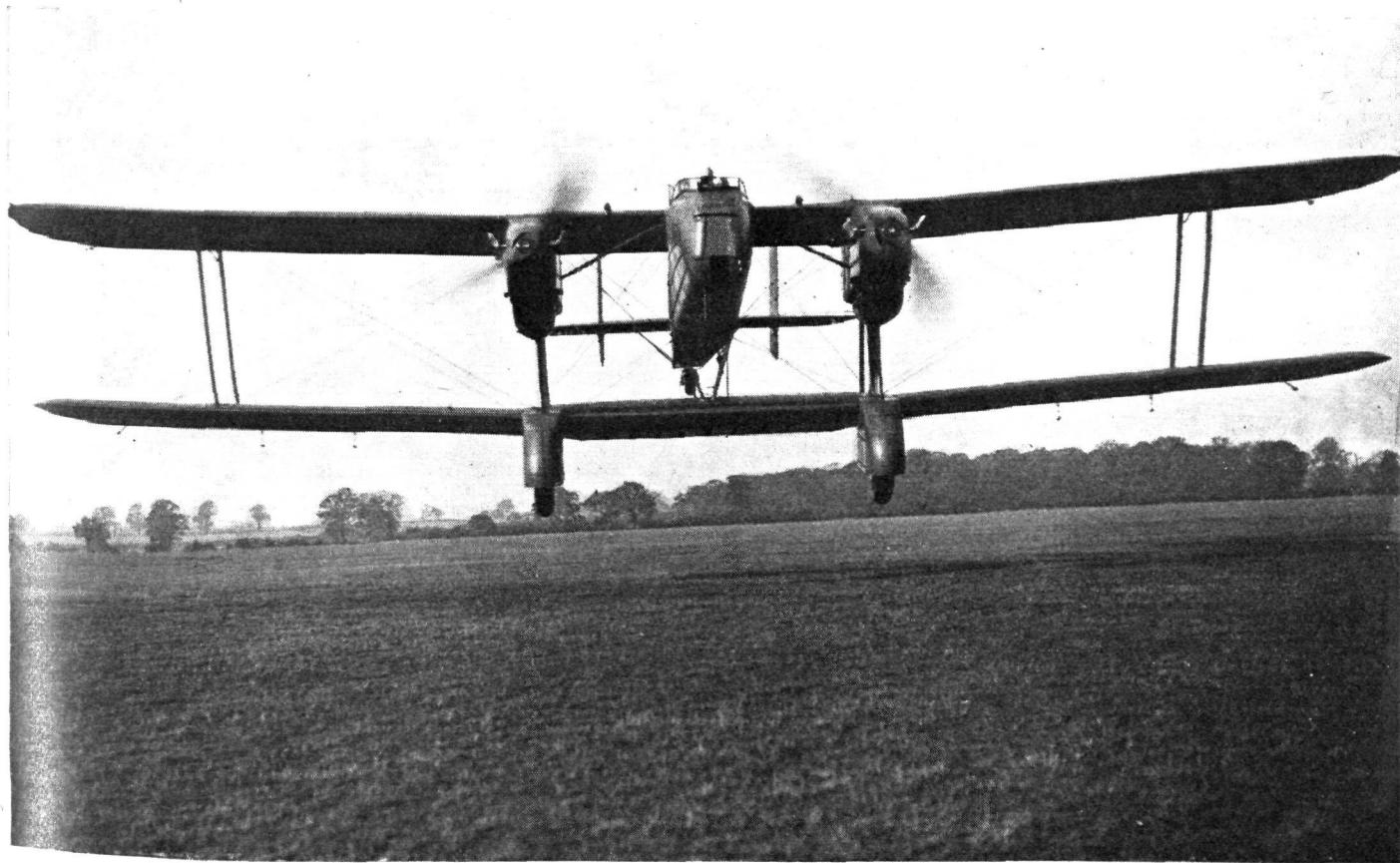
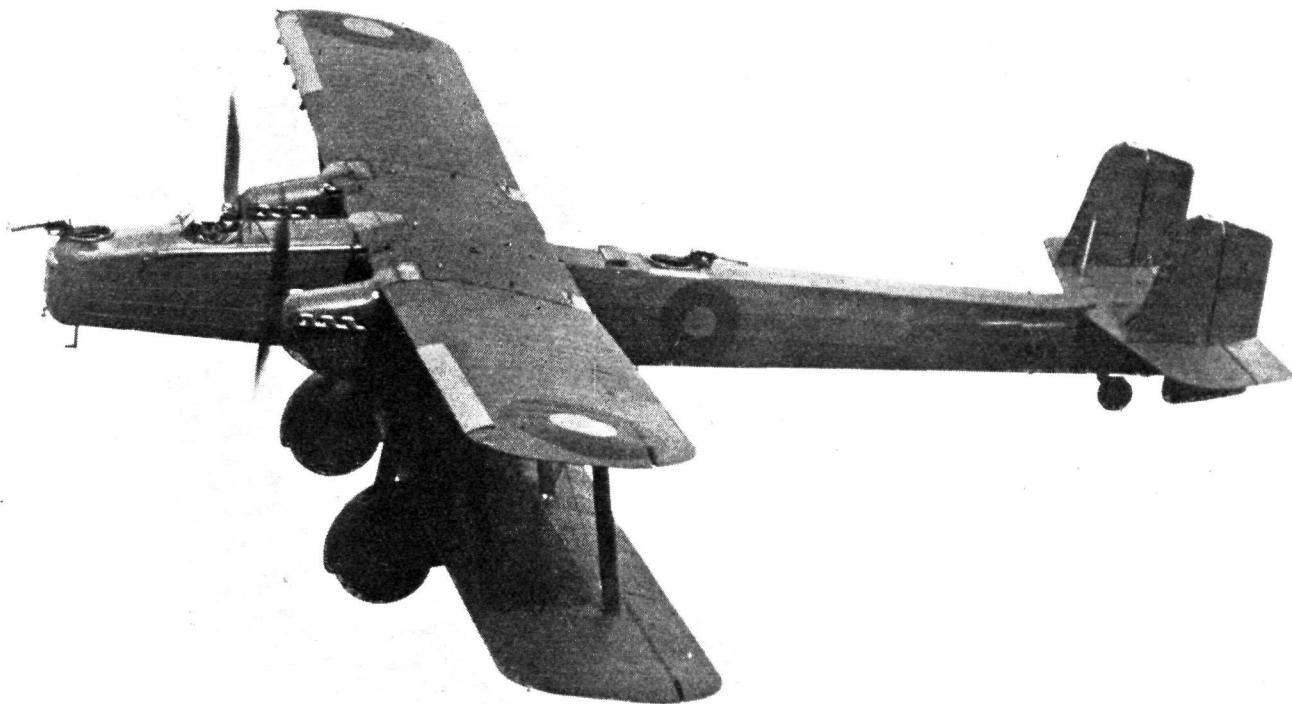
The French are running a useful service of combined aircraft and seacraft to South America, and the Germans have been experimenting with a service which depends on refuelling from the ship *Westfalen* in mid-ocean. Great Britain has so far sent out an expedition (under the late Mr. Watkins) to explore the possibilities of an air service across the North Atlantic by way of Iceland and Greenland—a route in which Col. Lindbergh has just shown considerable interest. Otherwise we have taken no steps which can compare with those of the French and the Germans.

Masterly inactivity is not always blameworthy, as classical authorities assure us. FLIGHT would never advocate starting a service with a type of aircraft which would doom the service to financial failure. It has been publicly announced that Imperial Airways are watching the possibilities of a service to America via the Azores and the Bermudas, and for the present we can ask no more than that. What we do hope is that the watch shall be really wakeful, and that when a chance of success presents itself the British Empire shall not be found unprepared to take advantage of it.

In this connection we should like to pay a tribute to the broadminded attitude of our French contemporary *Les Ailes*, which recalls that when the original Portuguese contract was granted to the French company, it wrote that it rejoiced at the success of France, but still regretted the arrangement as restricting the freedom of the air. Would that everyone else were equally broadminded!



## WELL PROTECTED



**READY FOR MARTLESHAM** : The first production model of the Handley Page " Heyford " bombers (Rolls-Royce " Kestrel " engines) was completed last week, and after constructor's trials was flown to Martlesham for official trials. Our photographer did not stand in a pit dug in the aerodrome when he took the head-on view. The pilot was Sqd. Ldr. T. H. England. (FLIGHT Photos.)

# England-Australia in under Seven Days

**I**T is not often that FLIGHT has to record, in two successive issues, the breaking of a record for a flight between two places. Mr. Ulm has, however, given us the opportunity of so doing; not that Mr. Ulm's flight from England to Australia is comparable with Sir Charles Kingsford-Smith's flight over the same route; it is not, but more on that subject later.

First, let us give the details of the flight. Mr. Ulm left Harmondsworth aerodrome at 10.30 p.m. on Thursday, October 12, as was recorded in FLIGHT for last week. He flew the 1,670 miles to Athens in one hop, arriving at the latter place soon after noon on the next day. Later in the evening he set off for Baghdad, and, flying through the night, arrived there about midday, Saturday, October 14. Karachi, the next halt, was reached during the afternoon of Sunday, October 15. After only two and a-half hours on the ground, Mr. Ulm once more took off bound for Calcutta, which he intended to reach without an intermediary stop, but was forced, by head winds and heavy rain, to land at Gaya in Bengal; eventually he landed at Calcutta, a short time before midday on Monday, October 16. Within 20 min. of his arrival the machine was once more wheeled out ready to take off again, but the central engine failed, and it was not until the next morning, Tuesday, October 17, that he left the ground and flew on to Akyab, where he arrived about midday. About four hours later Akyab was left behind, and, flying through the night, Mr. Ulm reached Alor Star just about in time to see the sun rise, on the morning of Wednesday, October 18. After a short rest for refuelling the flight was continued, and Singapore was reached soon after midday, and left behind a few hours later. Early in the morning of Thursday, October 19, Sourabaya was reached, and about five hours later, after two failures to get off the soft ground, Mr. Ulm was on the last stage of his flight. Finally, at midnight, or a few minutes after, the machine landed on Australian soil, at Derby, Western Australia.

To sum it all up, England was left at 10.30 p.m. on Thursday, October 12, and Australia reached at 4.15 in the afternoon (G.M.T.) of Thursday, October 19, which is a total time of 6 days 17 hr. 45 min., for a distance of just on 10,000 miles. The actual flying time was about

115 hr. With the aid of a little mental arithmetic, and/or a slide rule, it will thus be found that in 162 hours, the time taken by the flight, 115 hours were spent in the air. A detailed log of the flight is given in the accompanying table.

Mr. Ulm had with him two companions, both pilots, Messrs. J. Allan and P. V. Taylor. A third, Mr. John Edwards, appeared to have been with them in spirit if not actually in body, for how else can all the mistakes in the daily Press (yes, and even in FLIGHT for last week—Alas! even the mighty fall at times!) be accounted for?

The machine *Faith in Australia* is an Avro X, fitted with three Wright "Whirlwind J.6" engines. It was once called the *Southern Moon*, but since those days has been considerably altered. The wing, which is of wooden construction, has been widened, lengthened and strengthened, the axles have been altered, and the fuselage strengthened. In fact, the machine has been converted from a passenger machine into a long-range machine. Before leaving Australia it underwent trials with a load of 1,120 gall. of petrol on board, a total weight of 16,000 lb. *Faith in Australia* was to have been flown round the world, but unfortunately came to grief over in Ireland, which necessitated a short time in hospital before she was ready to go into the air again. A. V. Roe, Ltd., however, proved very capable doctors, and *Faith in Australia* was soon once more on her legs; presumably this little flight to Australia was just in the nature of recuperation, with the thought of some sterner work ahead. Mr. Ulm appears to have experienced slight trouble with his engines. At Calcutta, for instance, one of them refused to start, perhaps it did not like the weather, and sighed for the more sunny climes of its native land; there are, of course, British engines of a like horse-power which are not quite so fastidious. For accurate navigation, so essential on a long-distance flight, Mr. Ulm and his companions relied on Smiths' instruments, including a special drift plate, P.4 compass, and a Husun turn and bank indicator. Among the difficulties encountered on this particular flight must have been the risks of landing on, and taking off from, soft aerodromes; at Sourabaya, for instance, several runs had to be made before the machine left the deck, but *Faith in Australia*, even though heavily loaded, stood up to it, due



The *Faith in Australia* and her crew, including Mr. Edwards (white sweater), wireless operator, who did not accompany Mr. Ulm!

# ENGLAND TO AUSTRALIA

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**We offer our heartiest congratulations  
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By completing the flight to Australia in their Avro Ten, in under seven days, they have underlined more heavily than ever the potentialities of this Empire airway. This is the first rapid flight over the England—Australia route by a Commercial Aeroplane.

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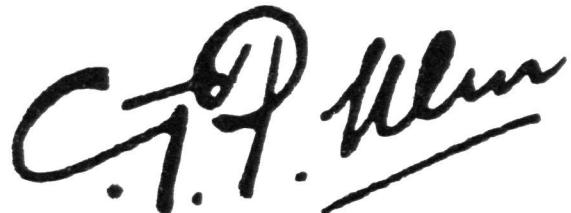


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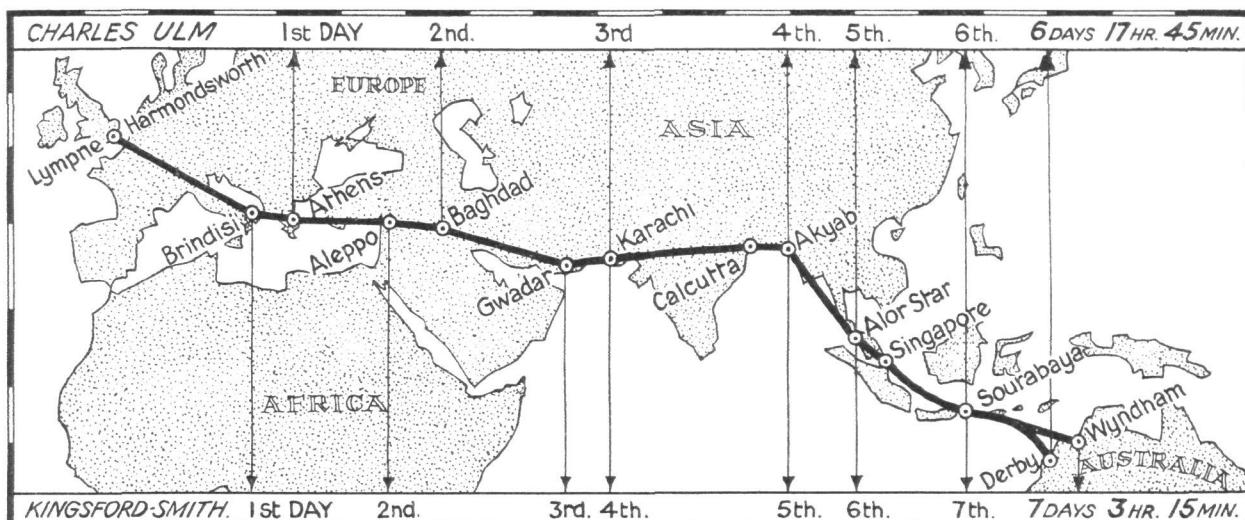
**“If there were a  
better oil than  
Wakefield Castrol  
I should use it”**



A handwritten signature in black ink, appearing to read "C. T. ULM".

By flying from England to Australia in 6 days 18 hours  
Capt. C. T. ULM has broken the record in his Avro Ten

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ENGLAND-AUSTRALIA : The two flights compared—Sir Charles Kingsford-Smith's solo dash and Mr. Ulm's effort with two companions.

no doubt to the fact that Palmer tyres and wheels, with which the machine was equipped, are designed for all conditions. Another difficulty with which Ulm had to

Ulm relied on Stanavo petrol and Castrol oil, and perhaps it should be mentioned that the Vacuum Oil Co. gave much assistance to the flight by making themselves responsible for the ground organisation.

As was mentioned above, this flight is not comparable with Sir Charles Kingsford-Smith's. Kingsford-Smith was flying solo, and therefore his was a greater feat of endurance, and perhaps, therefore, more worthy of admiration. On the other hand, it can well be argued that a flight such as Ulm's is of greater value, as more can be learned from it, and it suggests greater possibilities for the future. If three pilots can pack themselves into a large three-engined monoplane and fly to Australia in under a week, there is no reason why three other pilots should not do likewise only carrying mails, and with more stopping places for refuelling, so that a greater commercial load could be carried. Again, if the route is divided up into sections, there is no reason why the mails should not have an almost continuous journey, being transferred from machine to machine perhaps about every 600 miles or so. It is often argued that a fast air mail service to Australia is always going to be handicapped by the great difficulty of maintaining a lighted airway along the whole route, which, so it is thought, is, or will be, essential to a fast mail service in the future. Well, if three private individuals can fly from England to Australia, in a machine which is not particularly fast, and which is by no means new, within the span of a week, surely a company such as Imperial Airways, assisted by Government backing and experience, and elaborate organisation, can fly mails over the same route in, shall we say, under a fortnight.

\* Next day.

contend was the weather, a great deal of rain being encountered; however, the structure of *Faith in Australia* is used to rain by now, and no doubt the Cellon dope on the machine's fabric is largely responsible for this. For fuel,

## A Tribute to Sir Henry Royce, Bt.

ROLLS-ROYCE, LTD., has just brought out a little booklet in memory of Sir Henry Royce, who was born in the year 1863 and died in April, 1933. It is, as it is meant to be, a simple little tribute, printed for private circulation only. The pages contain extracts from obituaries which appeared in various publications. Reading these through one is struck by the simplicity of his nature, and the help which he must have rendered to many who were working along similar lines to himself. Sir Henry Royce's most striking characteristics seem to have been a desire for perfection in work, and exactitude of design, and, what he emphasised himself, a hatred of any waste of time.

## Insurance for R.A.F. Officers

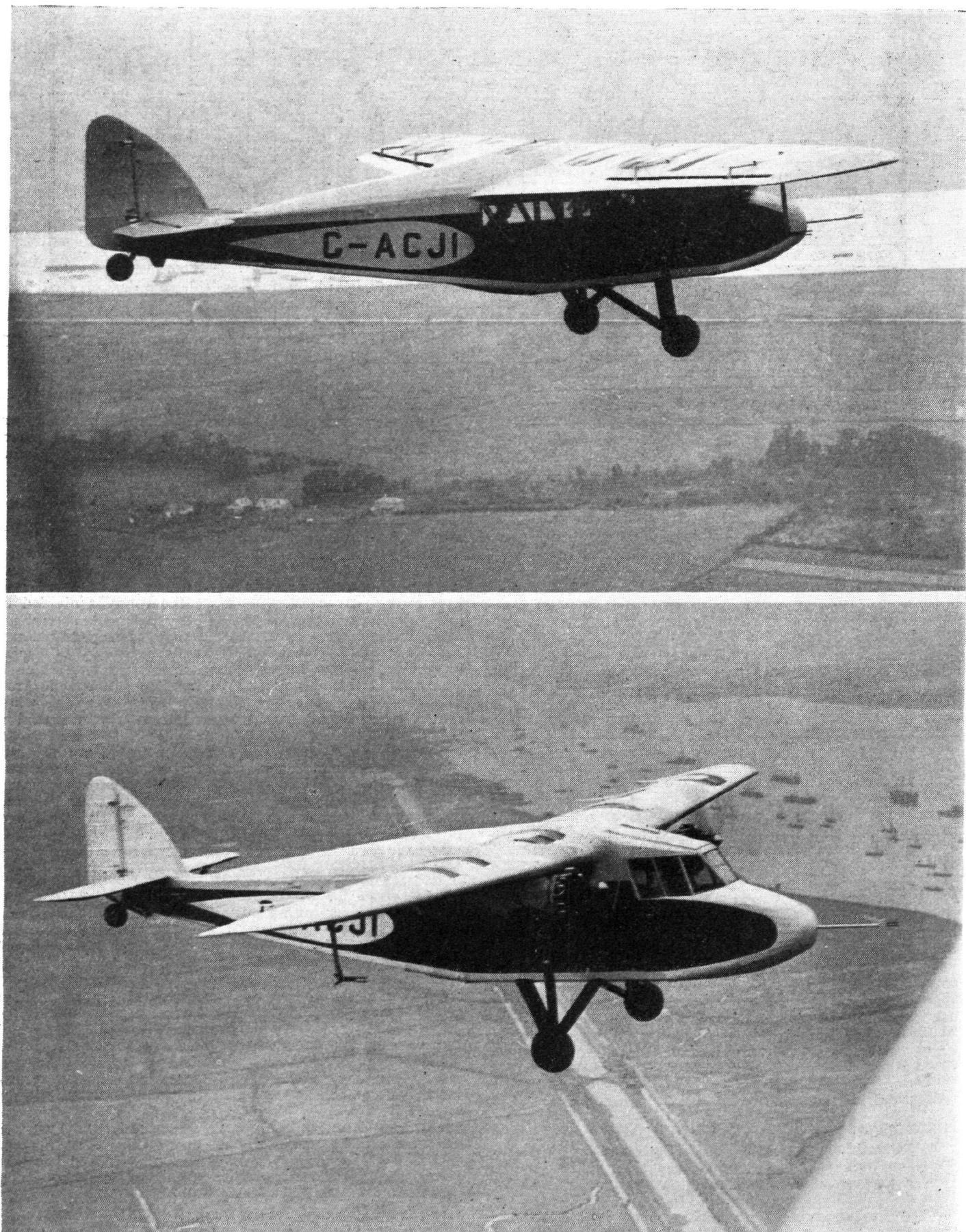
A SCHEME for providing life endowment insurance for officers of the Royal Air Force has been drawn up by George Pretyman, Aeronautical Consultants, and A. W. Bain & Sons, Ltd., Incorporated Insurance Brokers. The scheme aims at giving a reasonable endowment to serving officers. It can, perhaps, be best described by giving an example of a policy. A pilot officer between the ages of  $19\frac{1}{2}$  years and  $24\frac{1}{2}$  years pays the sum of £1 14s. 10d. monthly, that is, £20 18s. a year. In return for this he gets £300 at the end of 20 years; or £300 if he is permanently disabled resulting in his being invalided out of the Service by a Medical Board; or £300 to his representative if he dies from natural causes or as a result of an accident. So if the officer survives 20 years and claims back the £300

the insurance for that period only costs him £118. Supposing the officer taking out the policy only holds a short service commission, and at the expiration of his service, that is 6 years, does not wish to continue insuring himself for flying risks, his policy may be converted into an ordinary endowment policy with no insurance against flying risks, his premium is then reduced by 14s. 2d. a month. At the expiration of the term of the policy, that is, 20 years, he receives the cash payment of £300, which sum exceeds the premiums totalled together. Of course, policies for any amount can be quoted. It is very interesting to see some definite form of insurance quoted for R.A.F. officers, covering flying risks, it shows courage on the part of the promoters; it also shows that the risk of accident while flying is decreased, and, what is most important, in the judgment of those who make a special study of risks. Perhaps now that a lead has been given other insurance societies will advertise their willingness to quote policies covering flying risks.

## Aircraft Co. in South Africa

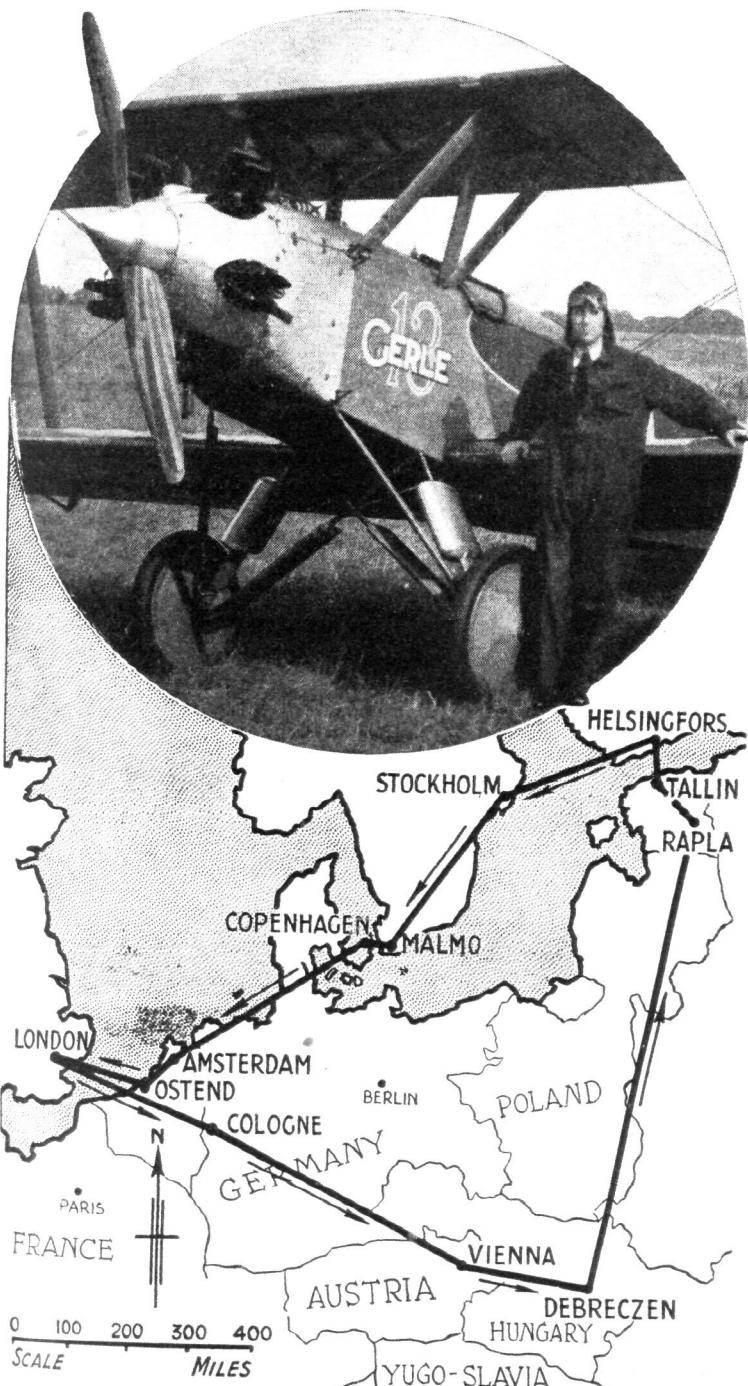
A SCHEME has been put before the South African Government for the establishment of an aircraft company in South Africa. The capital to be registered is £200,000. Lt. G. Fisher, who has assisted in drawing up the scheme, states that the company intends to build machines for use in certain proposed services and also others for public use. With the exception of a few technical experts, the personnel of the new company will consist entirely of South Africans.

## AN EFFICIENT MONOPLANE



**T**HOROUGH flight testing to weed out any possible "snags" before going into production is the policy adopted by Short Brothers in connection with the little civil monoplane with two Pobjoy "R" engines. The above views were secured at Gravesend Aerodrome by our Chief Photographer recently when

Mr. Lankester Parker was carrying out some tests. A deck fairing has been added to the previously flat top of the fuselage behind the wing, but so far it has not been possible, owing to unfavourable weather conditions, to determine the effect of this fairing on performance, stability and trim. The tests are being continued.



## 1025 MILES NON-STOP

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It was made on a 100 h.p. Siddeley Genet Major engined Gerle 13 designed and built at Budapest under the supervision of its pilot

Mr. Antony Banhidy.

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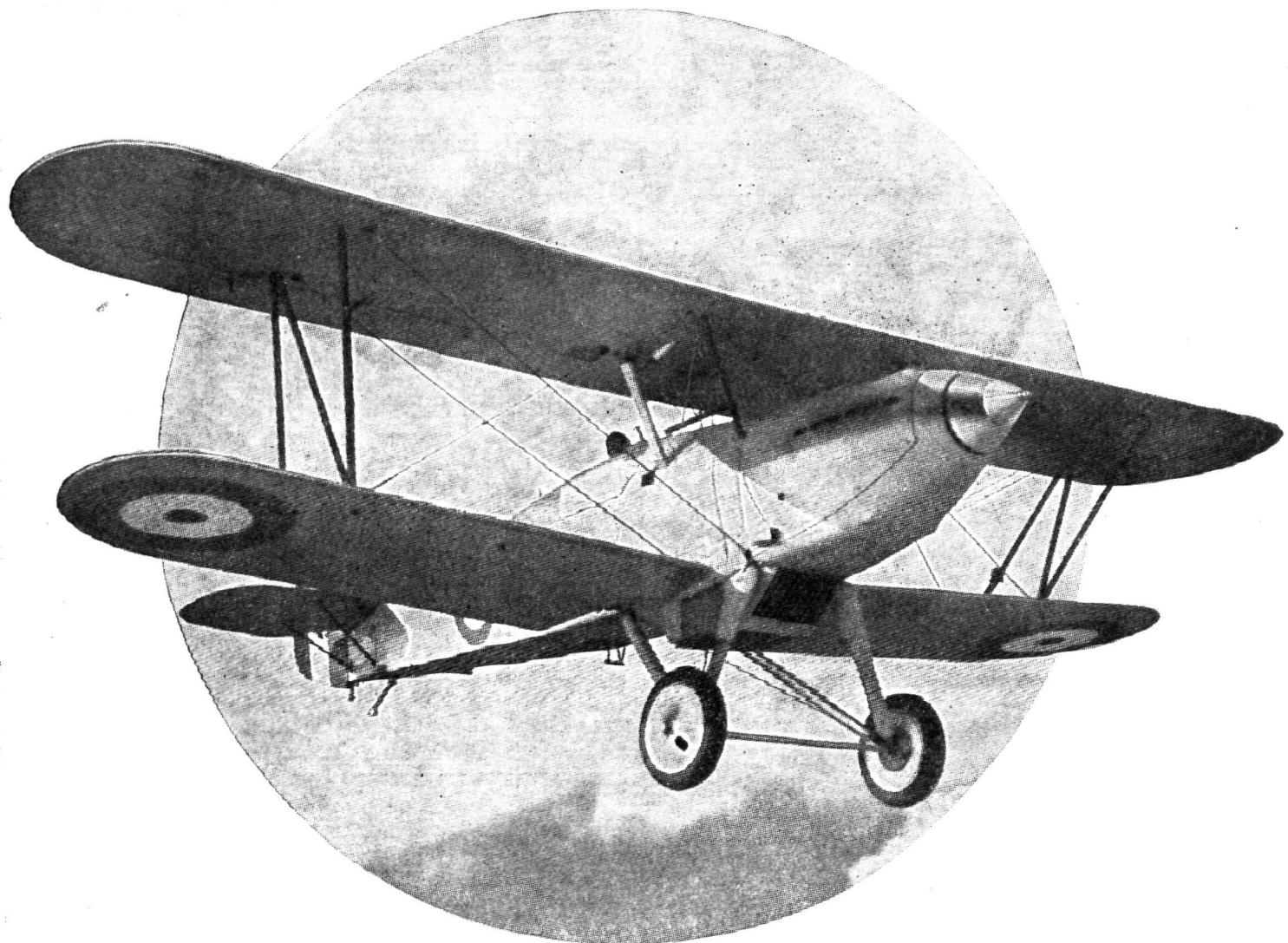
The four Siddeley Serval engines are situated in the ideal position on the wing, reducing drag to a minimum and safeguarding the propellers from accidental damage from stones.

The high wing monoplane affords an ideal view for the passengers and crew and provides them with welcome shelter from sun and rain when entering or leaving the machine.

Owing to its low build Atalanta is stable and easily manoeuvred on the ground. Maximum braking can be applied without danger.

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# From the Clubs

## NOVELTY AT READING

THOSE who have, since its inception, been responsible for the welfare of the Reading Aero Club under Mr. and Mrs. Charles Powis, have consistently shown that they were original and capable of keeping the club alive by thinking out many interesting variations of the common or garden flying meeting.

Saturday, October 21, was yet another of these occasions. Being a winter meeting, flying was only used as a means to get people there, and as the other attractions were designed, in more senses than one, to cater for the needs of women, it was pilots of this sex who were specially induced to fly there.

They were asked to arrive at 12.45 p.m., and the lady being nearest to this time was to receive a punctuality prize of £5. (We hope that it was not the intention of the promoters to suggest that all husbands might take similar steps to secure punctuality on the part of their wives.—ED.) As befits a lady in business, Mrs. Patterson, of Patterson Air Traders, Ltd., arrived within 30 sec. of the stated time and so secured an acceptable addition to the firm's till from the hands of Mrs. Shelmerdine. It was particularly appropriate that she should manage to do this with the first landing she had ever made in her Miles "Hawk" ("Cirrus III"), as this machine is, of course, made by Phillips & Powis, Ltd., at Reading, and was therefore at home. Mrs. Patterson had only taken delivery that morning, and had not had time to practise on the machine. She had flown away from the aerodrome some 50 miles, and on her return had secured the prize.

Among those who arrived by air we saw, besides Mrs. Patterson, Miss Cavendish Clarke, Miss Pacey, Miss Oldacre, Miss Niesen, Mrs. Rendall, Miss Giles, and Miss Hughes.

Among those who accepted invitations as guests there were: Mrs. Shelmerdine, Lady Elibank, Lady Swathling, Lady Muskerry; Mrs. Handley Page, and Mrs. Chamier.

The main attraction of the afternoon was a mannequin parade arranged by Peggy Morris, of 11, Berkeley Sq.,



CHEERIO! : Mrs. Patterson (in the cockpit of her "Hawk") receiving congratulations on gaining the "punctuality prize" at the Ladies' Meeting at Reading aerodrome last Saturday. (FLIGHT Photo.)

one of our best known dress designers, whom Mrs. Miles had induced to come down and display some of her latest creations. As a mere male we were somewhat out of our depths, but we do know when dresses are good to look at and when they suit anybody; all we can say by way of criticism is that we were devoutly thankful that the female portion of our family was not there, otherwise we should have been considerably poorer than we are now. A convertible dress with trousers underneath was perhaps the centre of interest, being specially designed for allowing women pilots freedom in the cockpit and a fashionable look on the aerodrome. After the dresses had been shown, flying kit from D. Lewis, Ltd., was displayed.

In conclusion we must mention the excellent work put in by Mrs. Batty, Mrs. Miles, Mrs. Powis, Mrs. Swann, Mrs. Helas and the other lady members of the Club, in preparing what was one of the best buffet luncheons it has been our pleasure to consume. The sandwiches were really appetising and the sweets novel. One of which we advise all gourmets to obtain the recipe, and to try for themselves, is of Danish origin and called röd gröd, which being translated means red fruit—but tastes much better, especially when smothered with cream!

## BROOKLANDS

A big improvement in the weather conditions has made flying instruction very hard to compete with, all School machines being kept continuously in the air. The total hours for the week ending October 21 were 130. Cross-country flights were carried out to Bristol, Eastbourne, Shoreham, Gravesend, Norwich, and Tynemouth. Mr. John Grierson has returned for a short stay awaiting the re-building of his machine. Also Messrs. Ahlers and Medl returned from Vienna. Sales have been kept active, Bill Thorn, having done good business in Amsterdam, returned on Monday, since when he has sold a "Gipsy Moth" to Mr. R. Morris, who is taking his "B" licence, and also a "Widgeon" to Mr. Wheeler. Mr. Wilson carried out his night flight successfully for his "B" licence. Miss Farniloe did her first solo. New members include Messrs. Oakley, Robertson, Wilson, Graham, and Ralph. Club members were much interested in the very fine display Bill Thorn put up the other day on the "Tiger Moth." His inverted figure of eight as done by Fieseler the other week at Villacoublay would give the finest aerobatic pilots some tips. George Lowdell has started on his well-earned leave, and the best wishes of all the staff go with Mrs. Lowdell and him for a very enjoyable holiday. Max Findlay has been again appointed as an Examiner of Instructors for the

Guild of Air Pilots, and has already examined a few instructors at Brooklands. Members are reminded that the Aero Club and B.A.R.C. dance on November 4 will be commenced with a firework display. Orders for Christmas cards should be placed as soon as possible with the Secretary of the Brooklands School of Flying.

## HANWORTH CLUB

The instructors at Hanworth have been busy giving dual instruction last week. On three days Lt. Everett has taken dual instruction on Lady Nelson's Stinson. Mr. Uebel was given cross-country dual to Cambridge, and Mr. Mertz also resumed his instruction on his return from Germany. Cross-country flights were also carried out by Mr. Hill, who flew to Oakham, Leicestershire, and return; Mr. Kirwan, who returned from Gloucester after three hours' flying; Lt. Helmore, who flew to Farnborough; and Com. Shirley, who flew to Gosport and return.

Mr. Dishley, a member of the Insurance Flying Club, carried out his first solo flight on Sunday, October 15. Mr. Roy Wheeler took further tests for his "A" licence on Thursday. Mr. Simmonds, M.P., took a further flight round the coast on Sunday, taking more photographs en route. Mr. C. Fuller returned in his "Gipsy Moth"

from Budapest, and Mr. I. Ramsay flew to Amsterdam in his "Martlet," and returned during the week. On Sunday, Lord Ratendene, who is Vice-Chairman of the Club Committee, visited the Hanworth Club.

#### YORKSHIRE AEROPLANE CLUB

Club machines flew approximately 21 hrs. during last week, and Mr. L. H. Heath completed his first solo. A successful and enjoyable dance was held at the club-house, Yeadon, in the new dance room, on Saturday, October 14, and was well attended.

Visiting aircraft during the week were:—G-ACCA, a "Fox Moth," on October 13, and G-EBXJ, an "Avian," piloted by Mr. Wynn, on October 15.

#### NORTHAMPTONSHIRE AERO CLUB

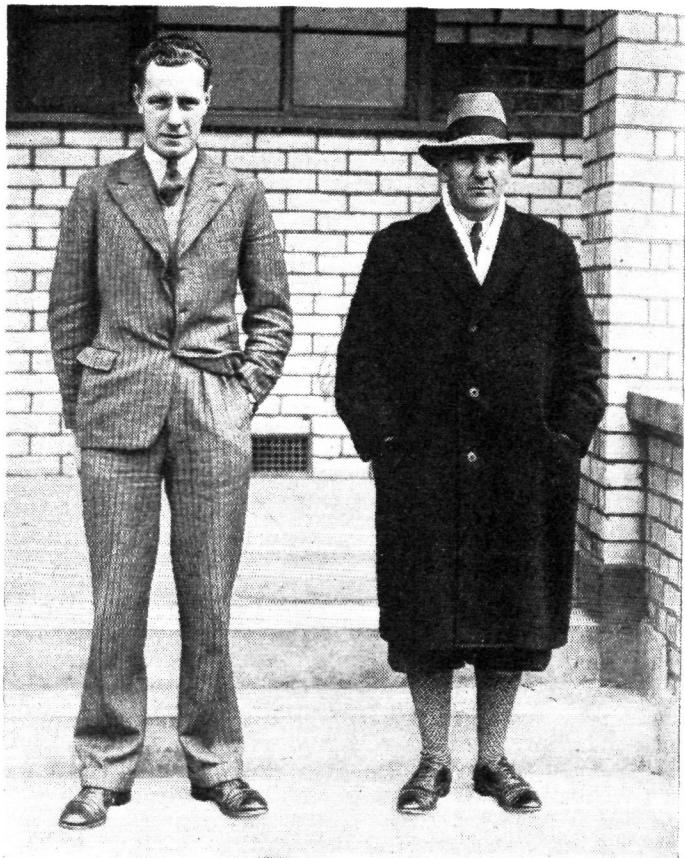
Flying time last week was 17 hr. 30 min. Mr. S. A. Buxton had his first dual instruction. The "When We Were Very Young" Party on Friday night was a huge success. About 80 members, appropriately dressed as children of all shapes and sizes, made "whoopee" until 2.30 a.m. The Linnell brothers arrived together in one small pram, and Capt. Geoffrey Shaw lost his slate fairly early in the proceedings. Two of our members, Miss Pam Cogan and Mr. Dick Pilcher, were kept busy receiving the congratulations of their friends on their recently announced engagement.

On Sunday, October 15, five machines from Sywell flew over in formation to the Fountain Hotel at Loughton, where the occupants lunched. They did not return in formation. It is hoped to make these "luncheon raids" a regular feature in the future.

Visitors by air last week included Mr. R. Bentley, Mr. Hill, of Birmingham, Messrs. Watson and Scholes from Heston, Marc Diamant and two passengers from Woodford and Capt. Fergusson from Heston.

#### NORFOLK AND NORWICH AERO CLUB

The following received instruction last week from Mr. J. Collier: Messrs. G. R. F. Clark, T. R. Ketton-Cremmer, and J. C. Smith. Soloists were Messrs. A. R. Kirkby, E. V. Goodhill, S. Hansel, H. C. Stringer, J. C. Smith, and A. R. Cox. Messrs. A. R. Kirkby and G. R. F. Clark flew to London during the week-end to visit the Motor Show. An event of interest was the photographing by the Club of the drifter *Olive*, which was driven up on the south beach at Great Yarmouth last week. At the time of writing these notes, there are only 25 tickets left for the Annual Ball which is being held at the Thatched Assembly Rooms on Friday, November 3. Fred Anderson's Park Lane Band has been engaged from 8.30 to 1 a.m. As there is not so much room for supper tables as in previous years, it is not possible to arrange for the assembly to sit down to supper in one lot. It has, therefore, been organised that suppers will be continuous from



GUIDING AT GRAVESEND: Mr. H. Gooding (right), managing director, and Flt. Lt. P. H. Smith, chief instructor at the Gravesend School of Flying. (FLIGHT Photo.)

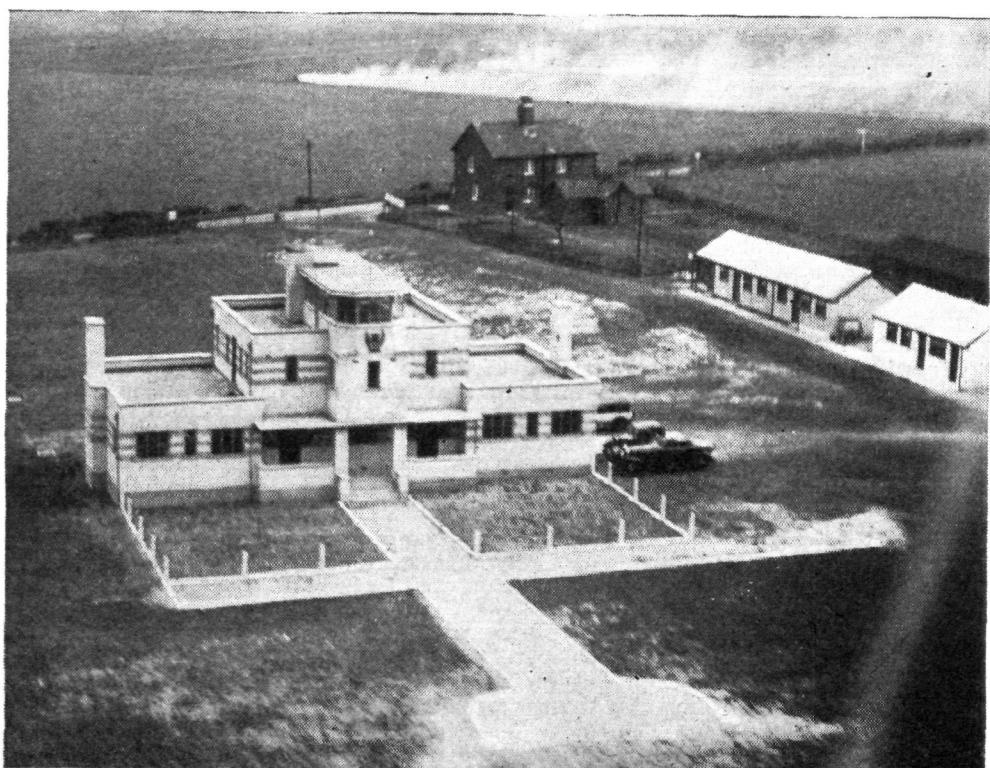
running buffets. There will be sufficient tables to accommodate everyone, but as supper is continuous, tables cannot be booked as in past years. Amongst those attending will be the Lord Mayor and Lady Mayoress, the Sheriff of Norwich and Mrs. Hanly, and the High Sheriff of Norfolk. Also, there will be a large gathering of R.A.F. officers from Andover, Martlesham and other R.A.F. stations. For the benefit of members who send Christmas cards overseas, the Club has prepared a number of cards with the Club crest dye-stamped in gold and a mounted aerial photograph inside, either of Norwich Cathedral or of the Broads.

#### CINQUE PORTS FLYING CLUB

A break in the weather has caused a considerable reduction in the flying hours, which for the two past weeks have barely totalled 50 hr. New members are Messrs. Wakefield, Templer and Andrew, and Drs. W. and B. Grillier. On Tuesday, October 17, Lady Lock visited the Club. The provisional date fixed for the Club's winter dance is Friday, November 24; it will probably be held at the Lees Cliff Hotel.

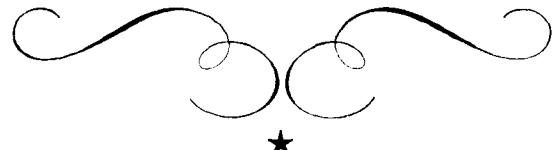
#### LONDON AEROPLANE CLUB

The flying times for the week totalled 61 hr. 10 min., bringing the times for the month up to 179 hr. 20 min. Mr. Mills made his first solo and Mr. Benachi his first solo long-distance flight. Among new members the Club



VISIBLE AND COMFORTABLE: The new finished club-house at Gravesend is easily seen from the air owing to its colour scheme. It is also very comfortable when you get inside, as our photographer found after taking this photograph in vile weather. (FLIGHT Photo.)

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## ON WATER

Mr. H. Scott-Paine, with his Napier-engined motor-boat "Miss Britain III," broke the BRITISH SEA MILE TROPHY RECORD and the Unofficial WORLD RECORD for single-engined boats with an average speed of **95.08 m.p.h.**

*(Subject to Official Confirmation)*

## ON LAND

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500 kms. - - -	„	123.63 m.p.h.
500 miles - - -	„	123.27 m.p.h.
1,000 kms. - - -	„	122.05 m.p.h.
3-hour - - -	„	124.33 m.p.h.
6-hour - - -	„	122.62 m.p.h.

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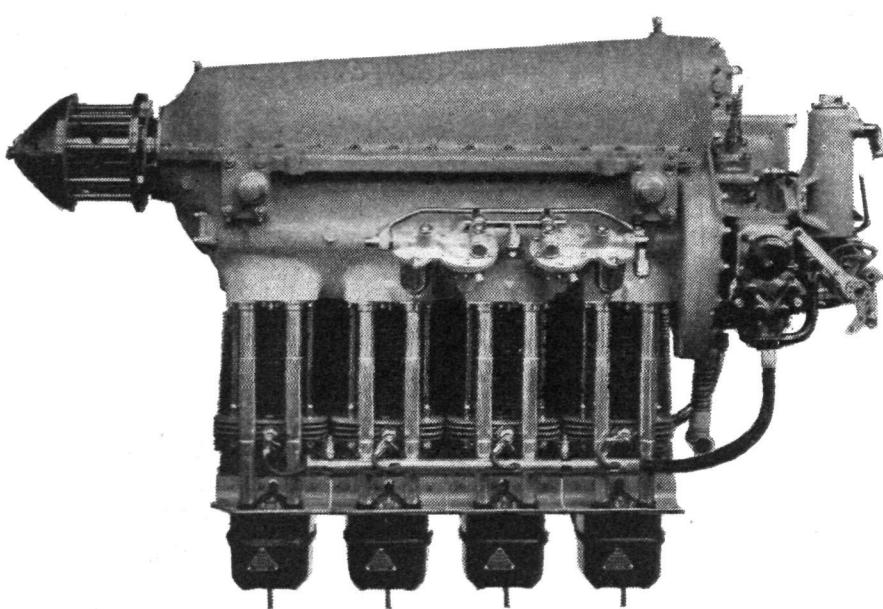
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 Winner 1931-32-33

**NORTH ATLANTIC**  
 1932-33 (twice)

**SOUTH ATLANTIC**  
 1931-33 (twice)

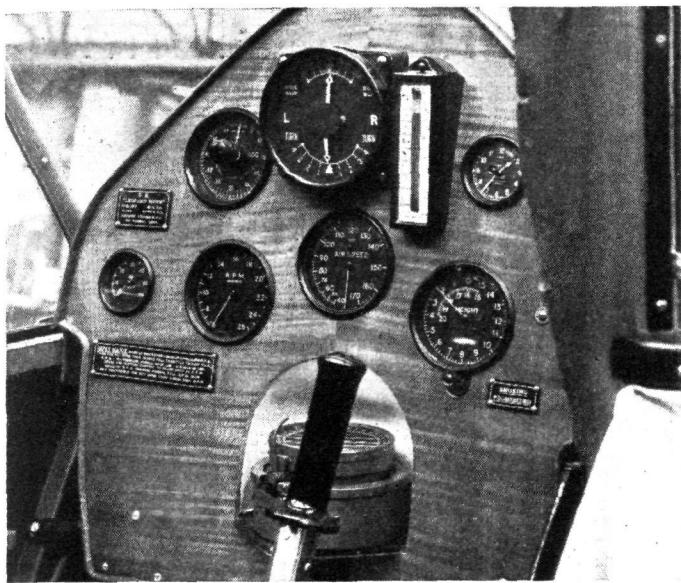
**AUSTRALIA RECORD**  
 Out 1930-31-32-33  
 Home 1931 (twice)

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 Out 1930-32 (3 times)  
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**NEAT** : The dashboard of a "Leopard Moth" ("Gipsy Major") belonging to Mr. Hunt, of South Africa. Besides the usual range of Smith's Instruments and the Husun Compass, there is an air log, at the top on the left-hand side, a Reid & Sigrist Turn and Bank Indicator in the centre, with a Pitch Indicator alongside it, and a Smith's clock on its right. (FLIGHT Photo.)

wish to welcome Mrs. Tindall, Messrs. J. W. Harrison, A. A. Tindall and E. H. Lonegaran.

#### MAIDSTONE FLYING SCHOOL

The weather has been particularly good during the last week and has brought out many enthusiasts ; Mrs. Stroud, Mrs. Goldspink and Mr. Michael Sassoon, the Vice-Captain of the Club, did several cross-country flights. The Aero Club are holding their first dance of the season on Saturday, October 28, the tickets being 10s. 6d. double and 6s. single ; the occasion is a special one to welcome Messrs. George Harris and Dennis Peacock, who are now operating the Flying School. \*

#### THE AIRCRAFT CLUB

In future the Aircraft Club will be operating from Sutton Bank, where three sailplanes will be stationed. The local headquarters will be the Golden Fleece Hotel, Thirsk. The Club's primary glider is nearing completion, and members are asked to turn up regularly at the Club Room in the evenings to finish it.

#### INSURANCE FLYING CLUB

A Special General Meeting will be held on Wednesday, November 1, at the offices of Messrs. Willis, Faber & Dumas, Ltd., 54, Leadenhall Street, E.C.3, at 6.15 p.m. sharp ; all members of the Club are asked to make a special effort to attend. Any who are unable to attend can obtain information from S. K. Wiltshire or P. R. Solder, 54, Leadenhall Street. The Club's President, Mr. K. K. Peters, General Manager of the Northern Insurance Co., will preside. The business on the agenda is: Report of Hon. Secretary, Report of Hon. Treasurer, New Flying Agreement with National Flying Services, Confirmation of Committee and Officers, and other business. The Club, through the generosity of Mr. Graham Mackinnon, have acquired a "Gipsy Moth." Since the beginning of September the Club have been entirely reorganised. The Committee consist of Messrs. S. K. Wiltshire and P. R. Solder, of Messrs. Willis, Faber & Dumas ; G. E. Claire, of the London & Lancashire Co. ; D. Hyde, of the Union of Canton ; C. Hughesdon, of the United British Co. ; D. King, of Messrs. R. Wild & Co. ; C. Barrow, of Messrs. Furness, Withy & Co., Ltd. ; and F. Dishley, of the Motor Union Co. The first two of these gentlemen have been elected Joint Hon. Secretaries, Mr. D. Hyde has been elected Hon. Treasurer, and Mr. D. King Flying Manager ; Mr. G. E. Claire has agreed to continue as the Club's Instructor. The subscription is £1 1s. a year, and a similar sum as entrance fee for new members. The flying charges are: Dual (new members),



#### Aero Golfing Society

THE Autumn Meeting for the Cellon Challenge Cup was held at Sunningdale on October 19, 1933, and resulted

£1 2s. 6d. an hour ; existing members, £1 an hour ; solo, all members, £1 an hour. Since the formation of the Club in July, 1932, the flying hours have totalled 500, and since April, 1933, six members have obtained "A" licences. Arrangements are now being made whereby full use may be made of the Hanworth Club-house.

#### NATIONAL AERO CLUB (I.F.S.)

The "Gipsy Moth," EI-AAK, has just been put back into commission after its annual overhaul for a C. of A., and the two instructors, Messrs. Curry and Griffith, are kept busy each day at Kildonan aerodrome, Dublin. At the present time about 100 pilot members are taking instruction, and it is hoped that a new machine will shortly be added to the fleet. Iona National Airways, who occupy the same aerodrome, have also had a busy time recently with charter work and visitors from England for the Irish hospitals sweepstake.

#### FROM THE CAPE

The flying school run by Aero Services (Pty.), Ltd., at Wynberg, is operating very successfully. At the present time they have over a dozen pupils learning to fly, and during the last year have given dual instruction to 34 people, nine of whom have obtained "A" licences at the school. The number of machines housed at Wynberg increases slowly but steadily, and at the present time there are two "Puss Moths," two "Moths" and one "Avian" privately housed, besides which there are the company's machines, consisting of one Spartan three-seater and two "Avians." Mr. Blake, who owns one of the "Puss Moths," has an aerodrome near his shooting camp on the Zambesi River, to which he flies frequently, and he is also leaving shortly to look after his gold interests at Rehoboth. Another private owner is Mr. J. N. Parker, an *ab initio* of the school, who is an official of the Overseas Communication Company, and uses his "Avian" to visit the Beam wireless station at Klipheuvel, about 30 miles north of Cape Town, where a landing ground has been prepared for his use. A considerable amount of taxi work has been done by the firm recently, including trips to Kimberley, Beaufort West, Port Elizabeth, George, Calvina, Caledon, Robertson, Worcester, Hermanus, Gordons Bay and Swellendam. Earlier in the year a tour of the Union was made for the purpose of demonstrating the Spartan three-seater ("Hermes II"). Over 30 different towns were visited, including Johannesburg, Pietermaritzburg, Durban, Kimberley and Mafeking. Throughout the 75 hr. flying time of this tour both the engine and machine gave excellent service. At Kimberley over 200 passengers were carried during the two days' stay, which is a severe strain on the machine, as the high altitude of the aerodrome necessitates a great deal of full throttle work. Also, during this tour night-flying demonstrations were given at Ladysmith, Durban and Kimberley. It will be remembered that we referred to the formation of Aero Services when Mr. Gordon Store went out to them in June, 1932.

#### TORONTO FLYING CLUB

The Toronto Flying Club staged an aerial pageant on Saturday, September 9, the first for five years. It was estimated that 25,000 people watched the display. To quote from a Canadian contemporary, "The din of applause after particularly daring displays of aerobatics, both vocal and by the unrestrained use of motor horns, testified to the crowd's appreciation of the hair-raising performances displayed by the sky monarchs. At times the deafening acclaim almost matched the cacophony of the planes' belching exhausts as a pilot dived down over the spectators, throttle wide open, at a 300-mile-an-hour clip." The pageant was officially opened by the Mayor, who welcomed the No. 1 pursuit group from Selfridge Field, Michigan, and other visiting American pilots. Thirty machines took part in a fly past, Capt. Jack Sanderson flew upside down, formation flying was done by three pilots of the Club, Messrs. Arthur Flack, Curtis C. Bogart and Charles Le Feuvre, their machines being tied together from take off to landing, and an exhibition of formation aerobatics by two officers of the Royal Canadian Air Force, Flying Officers L. E. Wray and J. H. Hurley, flying "Siskins." Flt. Lt. W. I. Riddell did solo aerobatics, also on a "Siskin." During the display the Curtiss "Hawk" was demonstrated by Pilot C. W. Crosswell, and a parachute drop was done from an "Autogiro."



in a win for Sir Henry White Smith, who returned 92 less 14 = 78. The Fourball Foursomes was won by Maj. C. J. W. Darwin and H. E. Perrin, who returned 5 up on bogey.

# THE 1934 INTERNATIONAL TOURING COMPETITION

Organised by the Aero Club of Poland, Next Year's Rules have been modified in certain Important Respects

**R**EALISING that the regulations governing the International Touring Competition did not altogether succeed in their main object of encouraging light aeroplanes suitable for private flying, the Aero Club of Poland has just finished drafting the first part of the 1934 regulations. Incidentally, it may be mentioned that entries must be sent in before November 15 next.

Before giving a *résumé* of the 1934 regulations it may be as well to recall that previous competitions have failed in several respects. The inclusion of a high-speed test rather tended to encourage racing machines instead of touring aeroplanes, and the fact that a tare weight limit was imposed resulted in certain instances in cutting down weight to danger point, with the result that machines broke in the air. Originally the weight limit was one of 400 kg. (882 lb.) for machines in the first category. It was found impossible to keep within that weight, and in successive competitions allowances of 10, 15, and 20 per cent. on this tare weight were made. For the 1934 competition the tare weight limit has been fixed at 560 kg. (1,234.6 lb.). Moreover, the competition will be limited to machines of category 1.

The actual date has not yet been fixed, but the International Touring Competition will be held some time between July 15 and September 28.

## The 1934 Competition

The International Touring Competition next year will include a series of technical tests, to be carried out at the Warsaw aerodrome, a Circuit of Europe, and a test of maximum speed. The technical tests will include a minimum speed test, take-off and landing tests, a fuel consumption test, engine starting tests, wing folding and spreading, and an examination for "practical qualities."

In the low-speed tests points will be awarded below a speed of 75 km./hr. (46.6 m.p.h.) at the rate of one point for each 0.25 km. This corresponds to 6.45 points for every mile per hour below 46.6 m.p.h. This regulation definitely encourages the machine able to fly slowly.

In the take-off and landing tests an obstacle 8 m. (26.2 ft.) high has to be cleared. For take-off distances below 250 m. (820 ft.) four points will be awarded for every 5 m. In the landing and pull-up tests the award of points is even larger, being six points for every 5 m. under 250 m. Thus, a machine landing vertically would, theoretically, receive 300 points, while one rising vertically would receive 200 points. This part of the regulations would seem to make the entry of an autogiro worth while. Competitors will be allowed four tries, but only the first two will receive full points, the third and fourth attempts being awarded 75 per cent. and 50 per cent. of the points only.

In the fuel consumption test a much greater distance will have to be flown than in the 1932 competition, viz., 600 km. (372.8 miles), instead of 300 km. The award of points for consumption is 10 points for every kg. (2.2 lb.) below 20 kg. (44 lb.) per 100 km. (62 miles). In order to



## Short "Rangoon's" Good Service

THE following details about an individual Short "Rangoon" are of considerable interest. The machine has just returned from service in the Persian Gulf. It was built specially for service abroad, and had its first trial in September, 1930, and subsequently did about 46 hr. flying before leaving the country. In February, 1931, the machine left for the Persian Gulf, and did not return until May, 1933, having done 734 hr. flying. On return to this country the machine was stripped for inspection. The fabric of the machine, which is doped throughout with "Cellon," was still in good condition, the only criticism being a few blisters on the identification discs. The hull, which is protected externally on top of the anodic treatment with "Cerric" Aluminium Lacquer, neither inside nor out, had suffered from corrosion, the protecting coatings all being well maintained, especially

prevent "cheating" by flying the fuel consumption tests at very low speed and the high-speed test at maximum speed, the two tests are linked together in this way, that the average speed in the Circuit of Europe must not exceed the speed in the consumption test by more than 15 km./hr. (9.3 m.p.h.).

For engine starting, points will be awarded as follows: Hand starting, 0 point; hand starting with safety device in case of back-fire, operated from outside the machine, 16 points; hand starting in the same way, but from inside the machine, 20 points; automatic starting, operated from the pilot's seat, 24 points. Starts from cold and with a warm engine must be made, and if the average of the times taken does not exceed two minutes, the full points for method of starting will be awarded. If this time is between 2 and 10 minutes, only 50 per cent. of the starting method points will be awarded.

In the dismantling, etc., tests the machine must be wheeled through an opening 3.5 m. (11 ft. 6 in.) high by 4.5 m. (14 ft. 9 in.) wide. A maximum of 12 points will be awarded machines the folded width of which does not exceed 3.25 m. (10 ft. 7 in.), which is the maximum permitted on the railways. A maximum of 9 min. will be permitted, and the full 12 points will be awarded if the operation is carried out in less than 1 min. Wing folding around several axes will receive six points, and folding around but one axis 12 points. The object of this system of awards is obviously to encourage folding arrangements in which the wings are not tilted broadside on to a strong wind, but as only six points are to be gained, designers will hardly let this influence their choice.

## The Circuit of Europe

For the Circuit of Europe the machines will be awarded points in accordance with average speeds. From 135-140 km./hr. (83.9-86.9 m.p.h.), 0 point; 140-190 km./hr. (86.9-118.1 m.p.h.), 12 points per km./hr.; 190-200 km./hr. (118.1-124.3 m.p.h.), 8 points per km./hr.; 200-210 km./hr. (124.3-130.6 m.p.h.), 4 points per km./hr. Below 135 km./hr. (83.9 m.p.h.) a competitor is eliminated, and no points are awarded for speeds above 130.6 m.p.h. Also the average speeds in the Circuit of Europe must not, as already mentioned, exceed by more than 9.3 m.p.h. the average speed in the fuel consumption test, otherwise the competitor will be awarded no points.

For reliability assessment each competitor starts with 160 points, from which is deducted 60 points for the first night spent outside the approved end-of-stage aerodrome, and 100 points for the second night so spent. Failing a third time results in elimination.

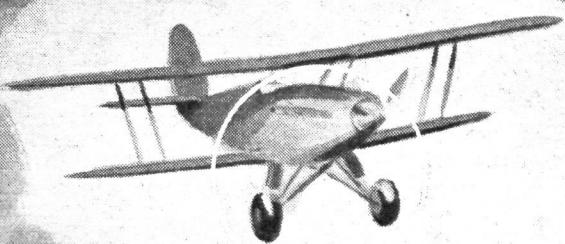
The high-speed test will be flown over a circuit not exceeding 300 km. (186.4 miles), and one point will be awarded for every km./hr. above 210 km./hr. (130.6 m.p.h.). The order of starting in the high-speed test will be arranged in accordance with the points gained previously, so that the first man home should be the winner of the 1934 International Touring Competition.



at points where local damage had occurred. The internal condition of the wings was also highly satisfactory. It must be remembered that the conditions in the Persian Gulf are not conducive to the well-being of a large flying boat. A very large proportion of the machine's time must have been spent in the open air. The climate in the Gulf can be very hot, and it is a damp heat which can be very destructive to aeroplane fabric.

## London University Engineering Syllabus

THE London University is including in its syllabus subjects connected with aeronautics. In the examination for a B.Sc., in 1934 only, candidates will be expected to show a knowledge of the Mechanics of Fluids. In examinations for 1935 and after candidates will be required to take papers in either Hydraulics or Aerodynamics. The latter subject will include Airflow Theory and Experiment, and Aircraft Motion.



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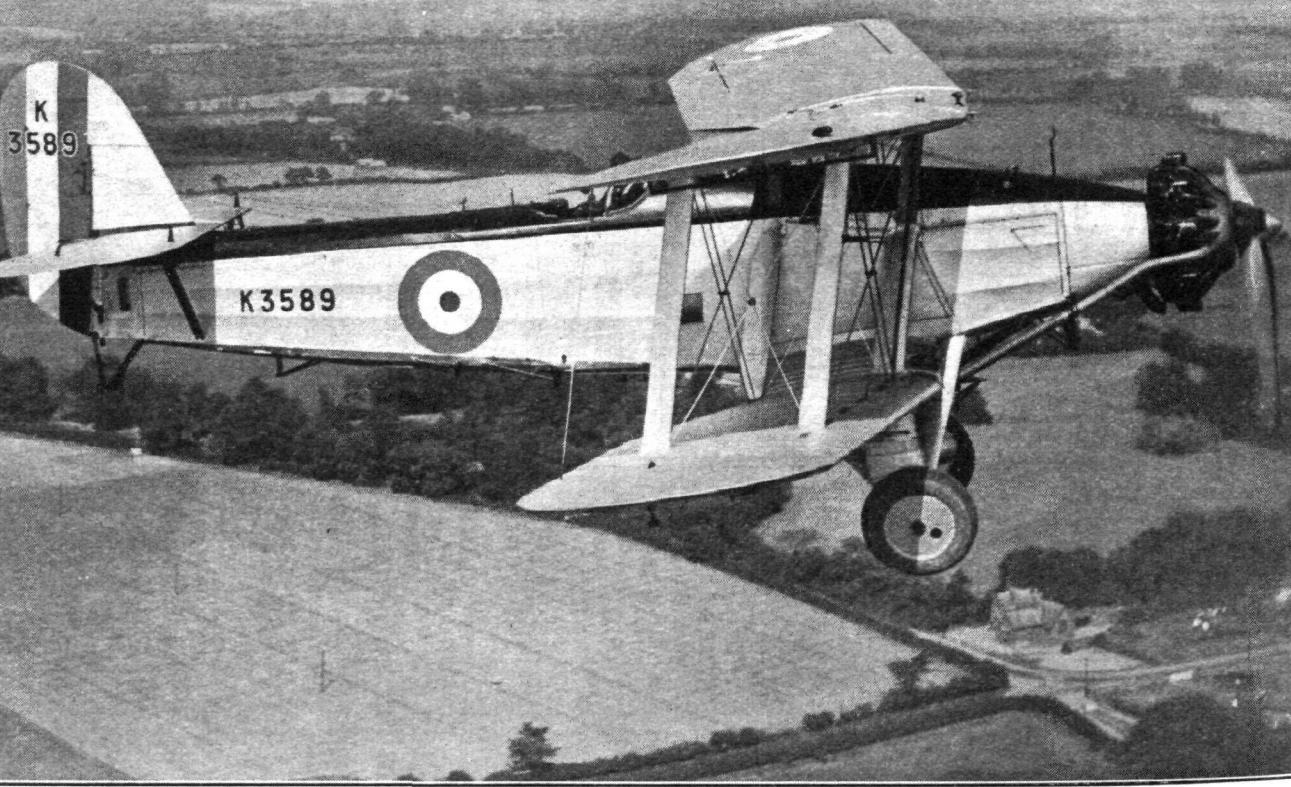
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# The AIRCRAFT ENGINEER

FLIGHT  
ENGINEERING  
SECTION

Edited by C. M. POULSEN

October 26, 1933

## CONTENTS

	Page
The Design of Aerofoils and the Prediction of Characteristics. By W. R. Andrews, A.F.R.Ae.S.	69
Tool Room Tempering Equipment	71
In the Drawing Office—	
Strength of Tubes. By K. Parkinson	72
Airwork Engine Service	73
Technical Literature—	
Marine Aircraft Design	75
Summaries of Aeronautical Research Committee Reports	75

## THE DESIGN OF AEROFOILS AND THE PREDICTION OF CHARACTERISTICS

By W. R. ANDREWS, A.F.R.Ae.S.

Mr. Andrews, who has contributed numerous articles to THE AIRCRAFT ENGINEER, is on the Technical Staff of A. V. Roe & Co., Ltd. He has been working on this article for something like a year, and has had to "scrap" large sections and start afresh on a new line of attack. We think it will be agreed that in the final presentation his method is as simple as such a complicated subject will allow.—ED.

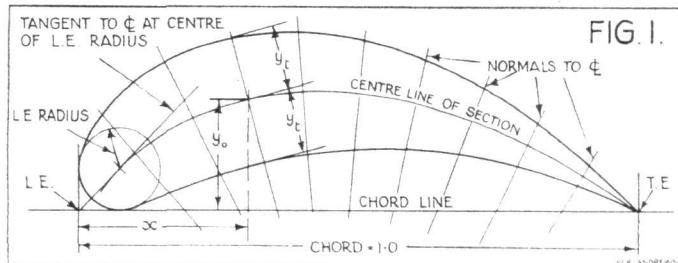
In the design of aerofoils and the analysis of their characteristics, it has been customary to use as datum the line passing through the centres of radii of leading and trailing edges (Ref. 1). The definition of camber has been the "rise" of the mid point between upper and lower surfaces when measured normal to the datum.

In a previous article (Ref. 2) curves for the estimation of profile drag were given in terms of the maximum camber, based on the above definition. These curves were obtained from the N.A.C.A. variable-density wind-tunnel test on series 00, 43-63 and 45-65 (Refs. 3, 4 and 5).

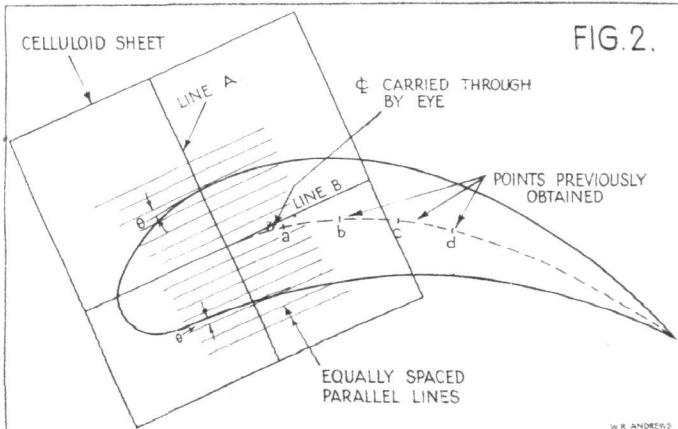
Since their publication, the test results of another series of aerofoils (Ref. 6) have been published. This series has the maximum camber at 40 per cent. of the chord and two camber ratios 4 per cent. and 6 per cent. combined with thickness ratios of from 6 per cent. to 21 per cent. of the chord. These tests give results on sections midway between series 43-63 and 45-65. All these aerofoils are numbered to define the principal geometric characteristics. The first figure gives the maximum camber of the section as a percentage of the chord. The second figure gives the position along the chord at which the camber is a maximum. This is expressed as percentage  $\div 10$ . The last two figures give the maximum thickness as a percentage of the

chord. Thus section No. 6406 has a 6 per cent. camber at 40 per cent. of the chord, and the maximum thickness of the section is 6 per cent., and so on.

The geometrical construction of these N.A.C.A. aerofoils is also somewhat different from that previously used. Instead of the profile being draped round the centre line by taking ordinates normal to the chord, the ordinates are set out normal to the centre line itself (see Fig. 1). This method of construction makes the analysis of existing aerofoils a little more complicated, but the test results so far obtained seem to justify its adoption for general use.



It is found that a piece of celluloid marked out as Fig. 2, and having a small hole into which a pricker can be inserted at the mid point, provides an easy means of obtaining the centre line of an existing aerofoil. The celluloid is moved about until line "A" cuts upper and lower surfaces at equal angles, and the mid point "B" is half way between the two sur-



## THE AIRCRAFT ENGINEER

faces. If this process is started somewhere near the point of maximum camber it becomes an easy matter as each preceding point gives an indication as to where the next should come. The line B must be tangential to the continuation of the curve passing through points *c*, *d*, *e*, etc. With a little practice this can be done by eye to a fair degree of accuracy. Small final adjustments can then be made by comparing points *g* and *h*. The closer together the parallel lines are on the celluloid the more accurate is the result likely to be.

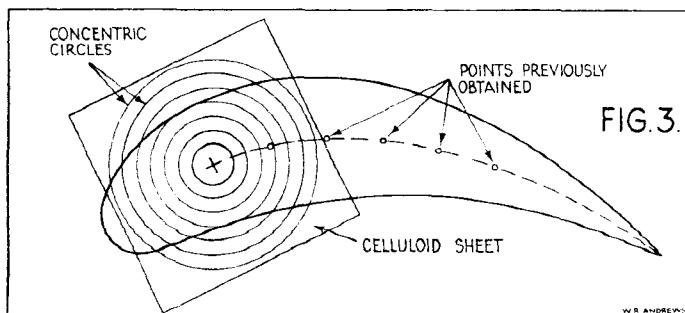


FIG. 3.

Where the rate of change of centre line slope is small, it will be found that sufficient accuracy is obtained by using concentric circles instead of parallel lines, and fitting the circles to be tangential at upper and lower surfaces, as shown in Fig. 3. The centre of the circle is then pricked through to form a point on the centre line.

For all ordinary aerofoils this latter method will probably be found sufficiently accurate. The small inaccuracies introduced due to the curvature of the centre line itself will be less than the manufacturing limits on the ribs, and certainly less than the change of shape due to fabric sag. Where a new design is contemplated the drawing of the profile offers little serious trouble. The amount of labour involved is, perhaps, slightly greater than when using the old method, but not much. The N.A.C.A. suggest calculating the points on upper and lower surface for given value of *x* on the centre line. This necessitates different values of *x* for both surfaces.

When dimensioning the drawing, the values of *y* for both surfaces are most conveniently expressed at the same value of *x*. These would be obtained by drawing through the calculated points and measuring the ordinates at the required value of *x*. The final accuracy, therefore, depends upon the skill of the draughtsman, so that there is no loss of accuracy by drawing the aerofoil by making the ordinates for the "fairing" normal to the centre line.

The calculation of the points on the profile are necessary where a scale model is to be made and absolute accuracy essential to the production of reliable comparative results. The refinement, however, does not seem justified for practical purposes.

The shape of the profile used by the N.A.C.A. is as follows:—

$$y_t = \frac{t}{0.20} \left[ \cdot 2969 \sqrt{x} - \cdot 126 x - \cdot 3516 x^2 + \cdot 2843 x^3 - \cdot 1015 x^4 \right] \quad (1)$$

where *y<sub>t</sub>* = Half thickness of profile.

*x* = Distance back from leading edge in terms of the chord.

*t* = Maximum thickness to chord ratio.

This profile has the maximum thickness at 0.3 of the chord.

It often happens that for structural considerations it is desirable to increase the depth of one of the spars. Such a procedure can very much alter the no-lift characteristics of the aerofoil. Say, for example, that in some particular design using a flat under-surfaced section, the depth of the section at the rear spar is

required to be increased. If the whole of the increase is put on the top surface, as would be inevitable, the no-lift moment will be increased almost in the same ratio as the slope of the centreline at the trailing edge. There would be a corresponding backward movement of the C.P. in level flight, which would necessitate a further increase in the rear spar strength. The nose of the aerofoil would be practically unaltered.

Where the section is not flat-bottomed, the temptation to add to one surface only is not so great. Generally, the most satisfactory way of overcoming the difficulty is to adopt a series of sections following mathematical laws, where the points of maximum camber occur at slightly different points along the chord. If one of these is draped round the original centreline, there is no change in the moment characteristic. By this means sudden changes of curvature are avoided.

Such a family can be built up from a simple formula such as

$$y_t = Kt (1 - x) (x^{\frac{1}{2}} + ax^{\frac{3}{2}}) = K (B + aD) \quad (2)$$

where *y<sub>t</sub>* = half-thickness in terms of the chord.

*t* = maximum thickness ratio,

and *B* and *D* have the following values:—

TABLE I

<i>x</i>	<i>B</i>	<i>D</i>	Values <i>y<sub>t</sub></i> for <i>K</i> = 1.0	<i>x</i> = 0.3 <i>a'</i> = 0.2961 for <i>K</i> = 0.9315
0	0	0	0	0
0.0125	0.1104	0.3302	0.2032	0.194
0.025	0.1542	0.3877	0.2690	0.2533
0.050	0.2124	0.4492	0.3454	0.3218
0.075	0.2533	0.4840	0.3966	0.3695
0.10	0.2846	0.5061	0.4345	0.4048
0.15	0.3292	0.5291	0.4859	0.4526
0.20	0.3578	0.5350	0.5162	0.4810
0.25	0.375	0.5303	0.5321	0.4959
0.3	0.3834	0.5181	0.5368	0.5000
0.4	0.3795	0.4772	0.5208	0.4850
0.5	0.3536	0.4205	0.4781	0.4455
0.6	0.3098	0.3520	0.4140	0.3856
0.7	0.2510	0.2744	0.3322	0.3095
0.8	0.1789	0.1891	0.2349	0.2189
0.9	0.0949	0.0974	0.1237	0.1152
1.0	0	0	0	0

The last column gives the special case where the maximum thickness occurs at 0.3 of the chord.

The value of "a" to give the maximum thickness at any point *x<sub>1</sub>* along the chord is given by

$$a = 2x_1^{\frac{1}{2}} \left[ \frac{1 - 3x_1}{5x_1 - 1} \right] \quad (3)$$

This relationship for values of *x<sub>1</sub>* between 0.28 and 0.333 c. is plotted in Fig. 4, and the value of *K* in Fig. 5.

A comparison between the N.A.C.A. centreline given by equation 1 and the one of the suggested family with the maximum thickness at 0.3 chord (Table I) is made in Fig. 6. The N.A.C.A. profile has a slightly sharper nose than the one given by equation 2, which means that for the same depth of front spar (on a two-spar wing) the N.A.C.A. section would have a slightly greater maximum thickness. For the same design conditions the overall difference between the two sections, so far as drag is concerned, is not likely to be measurable.

It will be noticed that the N.A.C.A. profile does not come to a sharp edge at the trailing edge, but has a definite thickness to accommodate the trailing edge

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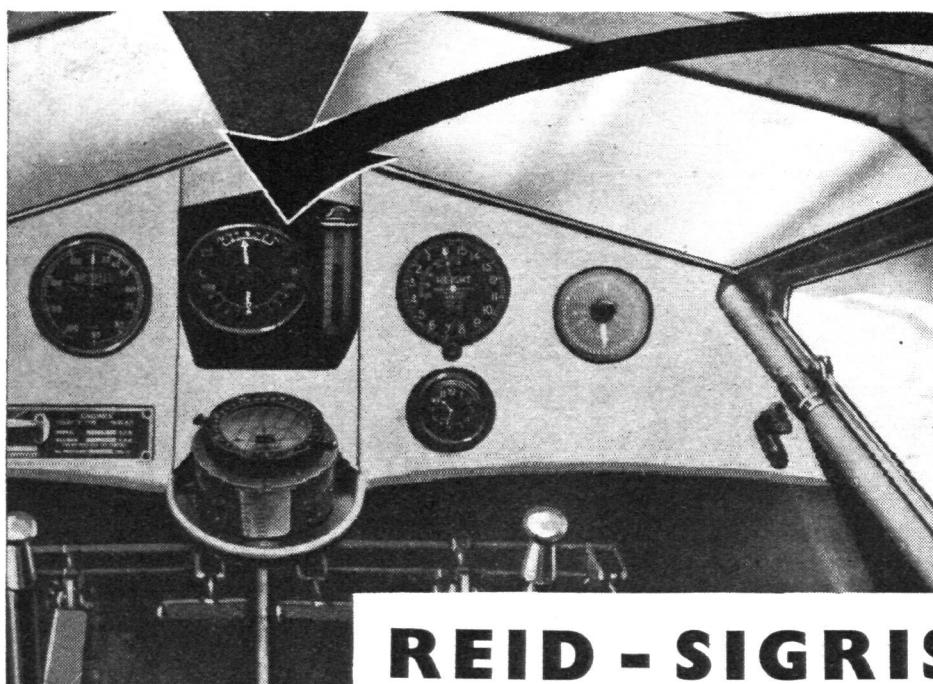
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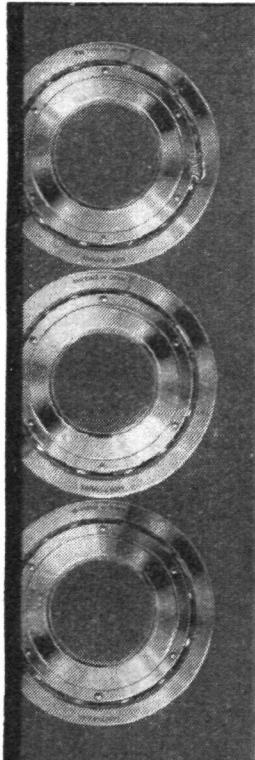
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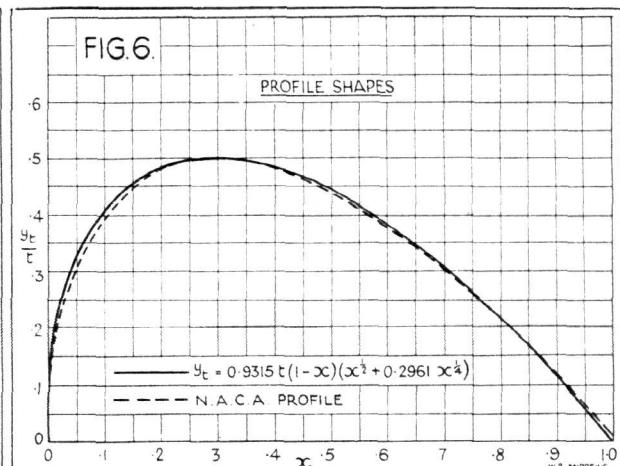
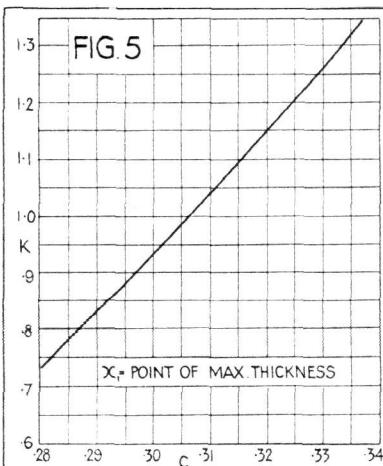
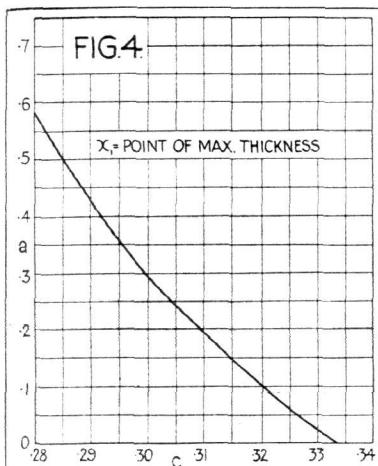
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tube. This can easily be arranged for on any of the suggested family of curves by designing the profile for a chord slightly in excess of the required chord.

The amount by which the design chord is in excess of the machine chord is given by

$$\Delta c = Kt (a + 1) d_1 \dots \dots \dots \quad (4)$$

$d_1$  = half depth required at T.E. (ins.)

Then the chord for calculating profile is  $C + \Delta c = 1.0$ .

Probably a simpler way is to add to the half-ordinates the amount  $d_1 x^2$ , so that the finally adjusted profile is given by

$$y_t = Kt (1 - x) (x^{1/2} + ax^{1/2}) + d_1 x^2 \dots \dots \dots \quad (5)$$

Where  $d_1$  is in terms of the chord length.

This small correction will not seriously affect the values of "K" and "a" already deduced.

So far as the writer is aware, there are no published results of tests in the V.D. Tunnel showing the effect of moving the position of maximum thickness.

Where structural considerations do not demand anything abnormal in spar depths at any particular point along the chord, it would seem unwise to depart from the N.A.C.A. profile shape, or similar, having maximum thickness at 0.3 of the chord.

The foregoing alternatives are only given to cover cases where this standard is not desirable, or possible, from structural considerations only.

(To be continued.)

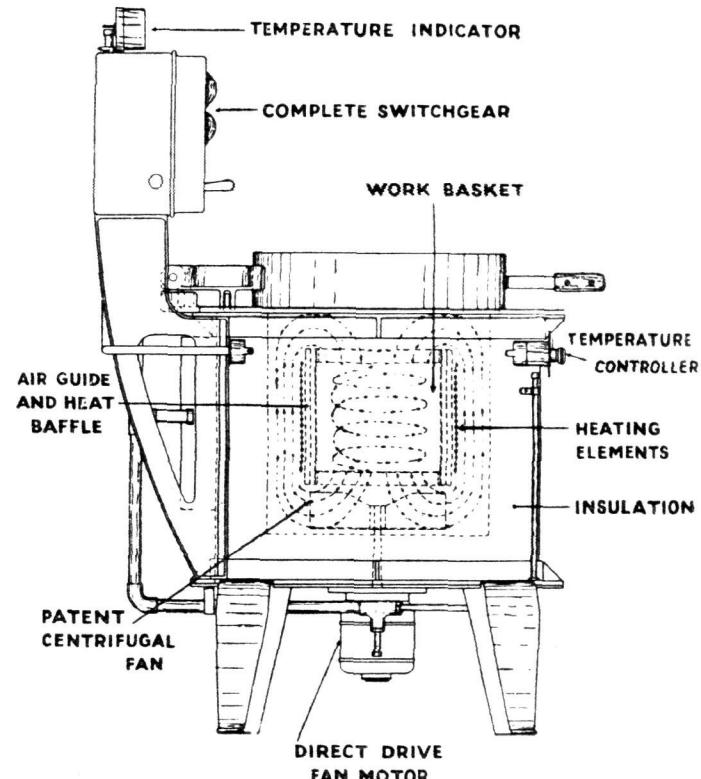
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- 2 "The Estimation of Profile Drag." W. R. Andrews. AIRCRAFT ENGINEER, June 17, 1932.
- 3 N.A.C.A. Technical Note No. 385. "Characteristics of Symmetrical Aerofoils." E. N. Jacobs.
- 4 N.A.C.A. Technical Note No. 391. "Characteristics of Aerofoils." E. N. Jacobs and R. M. Pinkerton.
- 5 N.A.C.A. Technical Note No. 392. "Aerofoil Tests in V.D. Channel." E. N. Jacobs and R. M. Pinkerton.
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#### TOOL ROOM TEMPERING EQUIPMENT

The letters "TRT" are used to denote the Tool Room Tempering unit recently introduced by Wild-Barfield Electric Furnaces, Ltd., of Elecfurn Works, London, N.7. That firm has, of course, had long experience in the construction of large furnaces with forced-air circulation for production tempering, and this experience has been applied in the production of the new smaller unit, which, as its title implies, is intended for the simpler equipment of the tool room. Two models are available, one being suitable for temperatures up to 400 deg. C. and the other up to 650 deg. C. The only difference between the two models lies in the design of the temperature regulator. The 400 deg. model is suitable for tempering carbon steel parts, while the 650 deg. pattern covers the whole range of tool-room tempering, both of carbon and of

high-speed steels. The powerful air circulation provided by the centrifugal fan produces exceptionally rapid heating, and also a very uniform temperature. The running cost will, of course, depend to some extent upon the locality in which the unit is installed, but it is claimed that in many cases the cost is definitely



Sectional Elevation of Wild-Barfield "TRT" Unit.

smaller than can be obtained with oil, lead or salt tempering baths which involve frequent replacement of the liquid. The maximum range of the outfit is 4 kw., but once the maximum temperature has been reached, the consumption is only about 1.5 units per hour.

In order to combine the desirable features of rapid initial heating with close temperature control, a switch is provided on the panel, by means of which one section of the heating elements may be cut out. By thus reducing the rating of the furnace, exceptionally close temperature control is provided, even at temperatures down to 200 deg. C., and it is claimed that the most delicate dies, press tools, milling cutters, etc., can be treated without the slightest risk of damage.

The whole equipment has been designed with a view to the utmost simplicity in operation and installation. All connections between the furnace and its associated electrical gear are made before despatch, and the user is merely required to connect the mains supply leads to the switch panel, when the furnace is ready for immediate operation. The chamber is cylindrical, lined with

## THE AIRCRAFT ENGINEER

high-grade insulating material, and is fitted with an inner refractory container which holds the work basket. The latter has a perforated bottom to permit of the free circulation of air, and is fitted with a lifting ring to facilitate handling.

The elements are formed of heavy section nickel-chromium wire supported on a special grooved refractory former. They are divided into two circuits,



General View of Wild-Barfield "TRT" Unit.

enabling the input to be reduced for low-temperature working. The maximum rating is 4 kw., and elements are made for 200/250-volt supplies.

A centrifugal fan, which is patented, is fitted at the bottom of the chamber, below the work basket, and is mounted directly on the shaft of a vertical spindle motor. Its design, while being simple and robust, is such that, under normal working conditions, the maximum possible volume of air is circulated. A suitable guard fully protects the fan.

An expansion type temperature controller is fitted, having a large diameter scale providing adjustment over

a wide range. A circular pattern temperature indicator is mounted on top of the switchgear panel, and is complete with thermo-couple.

A totally-enclosed ironclad panel carries the main isolating switch and automatic switchgear, complete with protective devices for the furnace and fan motor. Pilot lamps and input control switch are incorporated in the panel.

### IN THE DRAWING OFFICE.

#### STRENGTH OF TUBES

By H. PARKINSON.

THE chart for strength of tubes in tension is based on 10 tons per sq. in. in order to make it applicable for any material. The reduction in strength due to loss of cross-sectional area by drilling for end fixing pins or bolts is based on:

$$T = f_t [\pi t (D - t) - 2dt] \quad \text{Fig. 1.}$$

where  $T$  = ultimate tensile strength of tube in lb.

$$f_t = \text{ultimate tensile stress of material in lb. per sq. in.}$$

On this assumption,  $T$  is slightly higher than the actual value in that no allowance is made for loss of area due to drilling a circular wall (Fig. 2).

The strength of a 2-in. o/d by 17 s.w.g. tube with a  $\frac{1}{4}$  dia. end fixing bolt would be:

from Fig. 3.

Strength on full diameter	...	7,650
Allowance for $\frac{1}{4}$ dia. hole	...	630
Ultimate tensile strength at	...	—
10 tons sq. in. ...	...	7,020

Any other value of  $f$  is in direct proportion to 10.

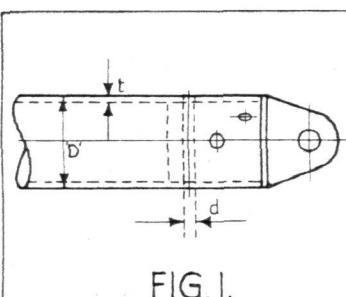


FIG. 1.

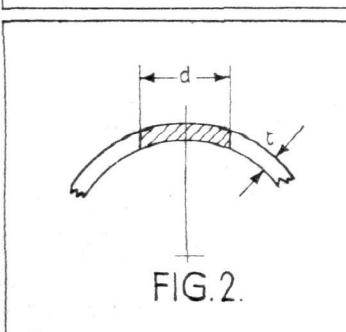
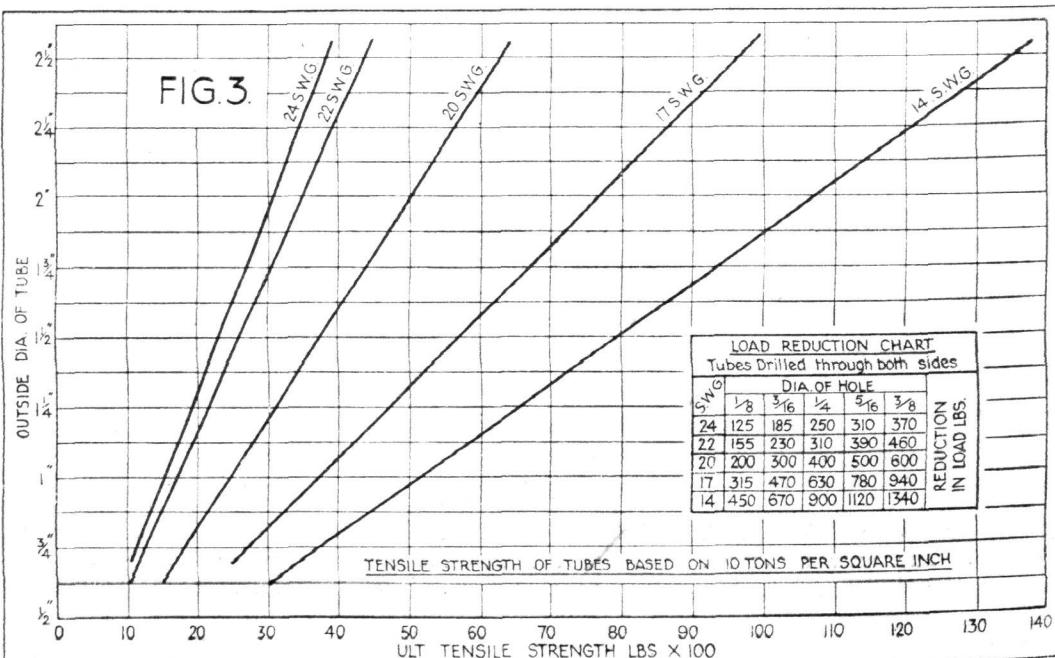


FIG. 2.



## THE AIRCRAFT ENGINEER

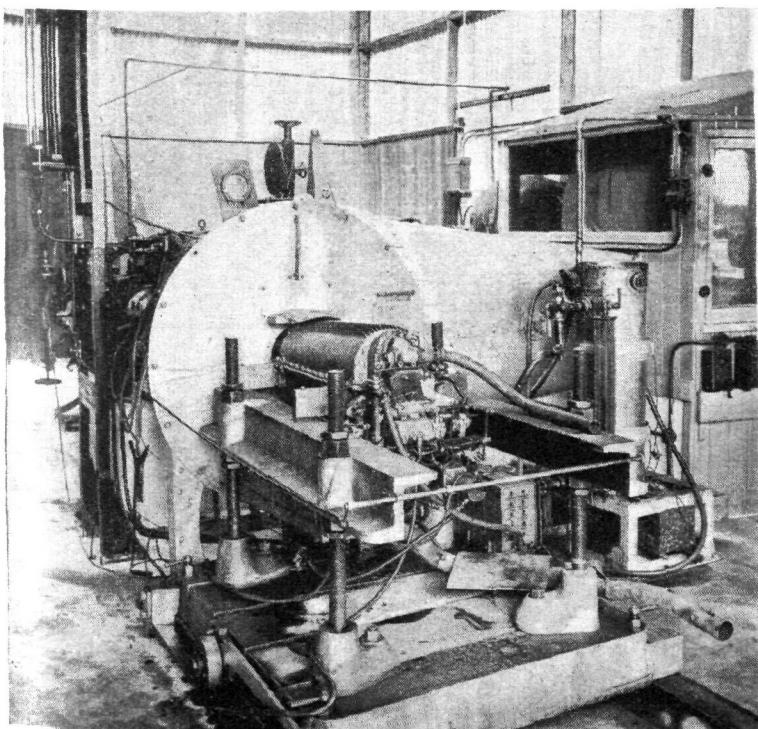
## AIRWORK ENGINE SERVICE

Airwork Engine Service, Ltd., is the name of an up-to-date organisation established at Heston Airport. The firm, which is under the able management of Mr. E. B. Graham, is a separate company, but, of course, works in the very closest co-operation with the associated company, Airwork, Ltd. The firm specialises in the overhaul of aero engines, but does also a great deal of overhaul work for road traction and omnibus companies. The workshops of Airwork Engine Service at Heston are well equipped for the work, and use is made of some of the very latest machines available. The equipment includes a Heenan & Froude Dynamometer, capable of testing engines up to 450 b.h.p., and at airspeeds up to 150 m.p.h. Complete Air Ministry type tests can be made. Some idea of the quantity of work done may be formed from the fact that for the last three months the company has carried out 140 cylinder bores per week.

Perhaps the best way of indicating how the work of overhauling and re-conditioning an engine is carried out will be by following such an engine from the time it arrives for overhaul until it is passed out ready for flight. As each part is removed from the engine, it is



INSPECTING A CYLINDER BORE : Six measurements are taken, 2 at the top, 2 in the middle, and 2 at the bottom.  
(FLIGHT Photo.)



THE ENGINE TEST HOUSE OF AIRWORK ENGINE SERVICE : A Gipsy III is shown on the Heenan and Froude Dynamometer on the left, while on the right are the controls, meters, etc. (FLIGHT Photo.)

1072e

## AIRWORK ENGINE SERVICE LIMITED

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## CYLINDER INSPECTION REPORT SHEET 1V

Customer's Name.		Job No;		
Messrs Brian Lewis & Co Ltd.		AE 31.		
MAKE.	TYPE.	NOMINAL DIAMETER.	OVERSIZE.	LIMIT.
De Havilland	Gipsy III	114 mm	NIL	.003 OVALITY .008 TAPER.

DIFFERENCE IN <sup>WORN</sup> <sub>REGRND</sub> FROM NOMINAL OR REGRND DIAMETER.

X Represents dimension across the THRUST axis &amp; = is the dimension across the GUDGEON PIN axis of the cylinder.

THE TOP READING IS TAKEN AT THE END OF THE TOP RING TRAVEL IN WORN CYLINDER.

No. of CYLINDER.	1	2	3	4	5	6	7	8	9
TOP	= .0015	+	+	+	+				
	X .002	+	+	+	+				
CENTRE	= .001	+	+	+	+				
	X .002	+	+	+	+				
MOUTH	= .0005	0	0	+					
	X 0	0	0	+	+				

## REMARKS.

*Walls in good condition - No scores.*

DATE...1.1.33.

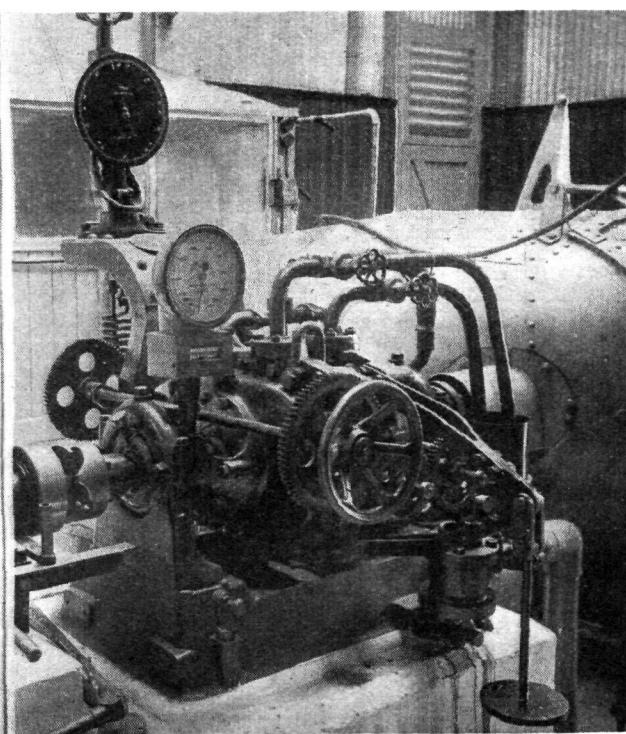
(Signed) *H. Watts*

## AIRWORK ENGINE SERVICE : A typical cylinder report sheet.

washed in a paraffin cleaner, and a superficial examination is made. Any obviously unserviceable parts are thrown away, and the rest are put in a chemical bath, which removes all traces of foreign matter. The parts are then inspected with a high-powered microscope.

The next step is an inspection for wear. Parts which are within the limits set by the engine makers are retained, while the others are replaced.

Crankshafts are tested, in addition to the usual micro-



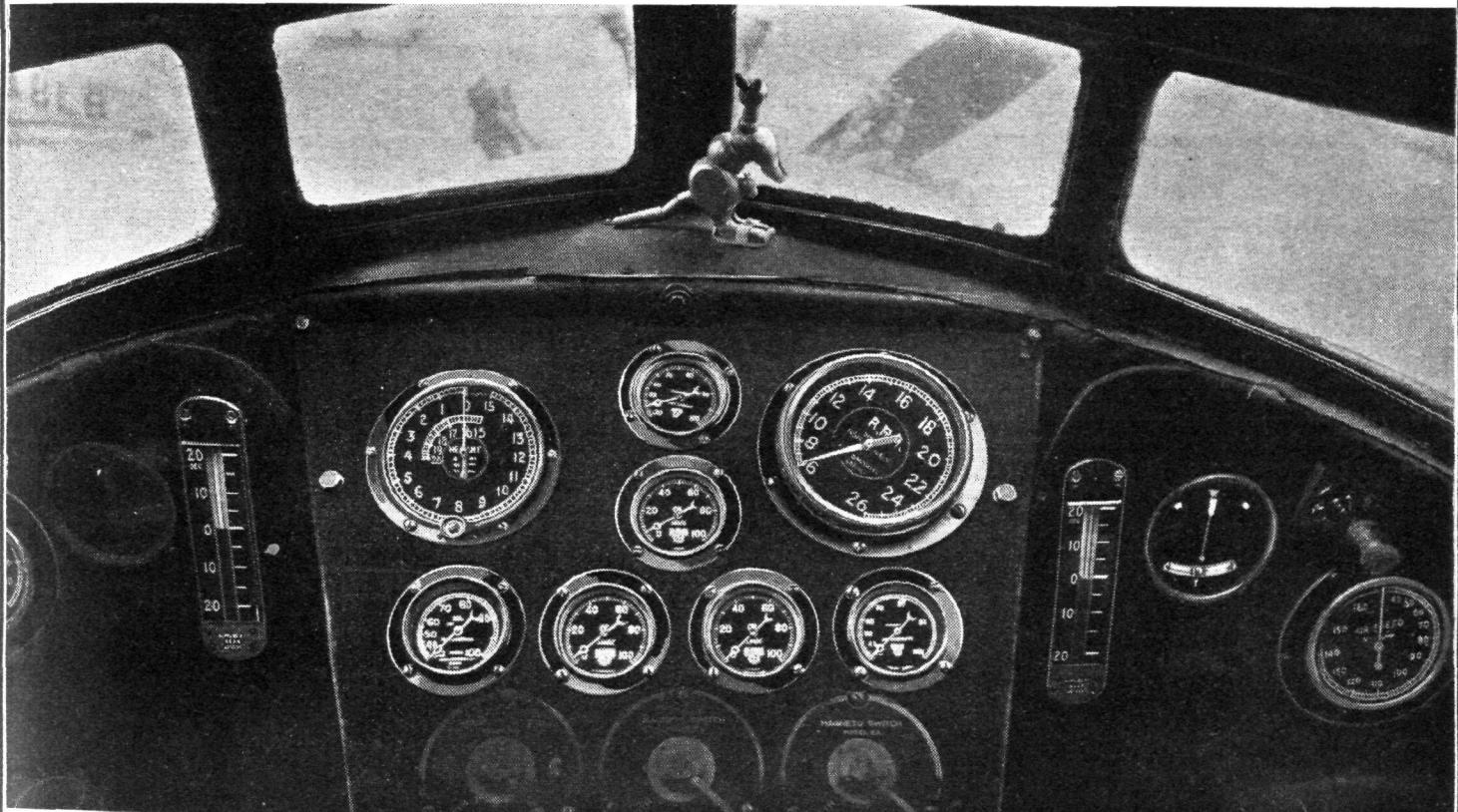




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INSTRUMENTS

**“HUSUN”**  
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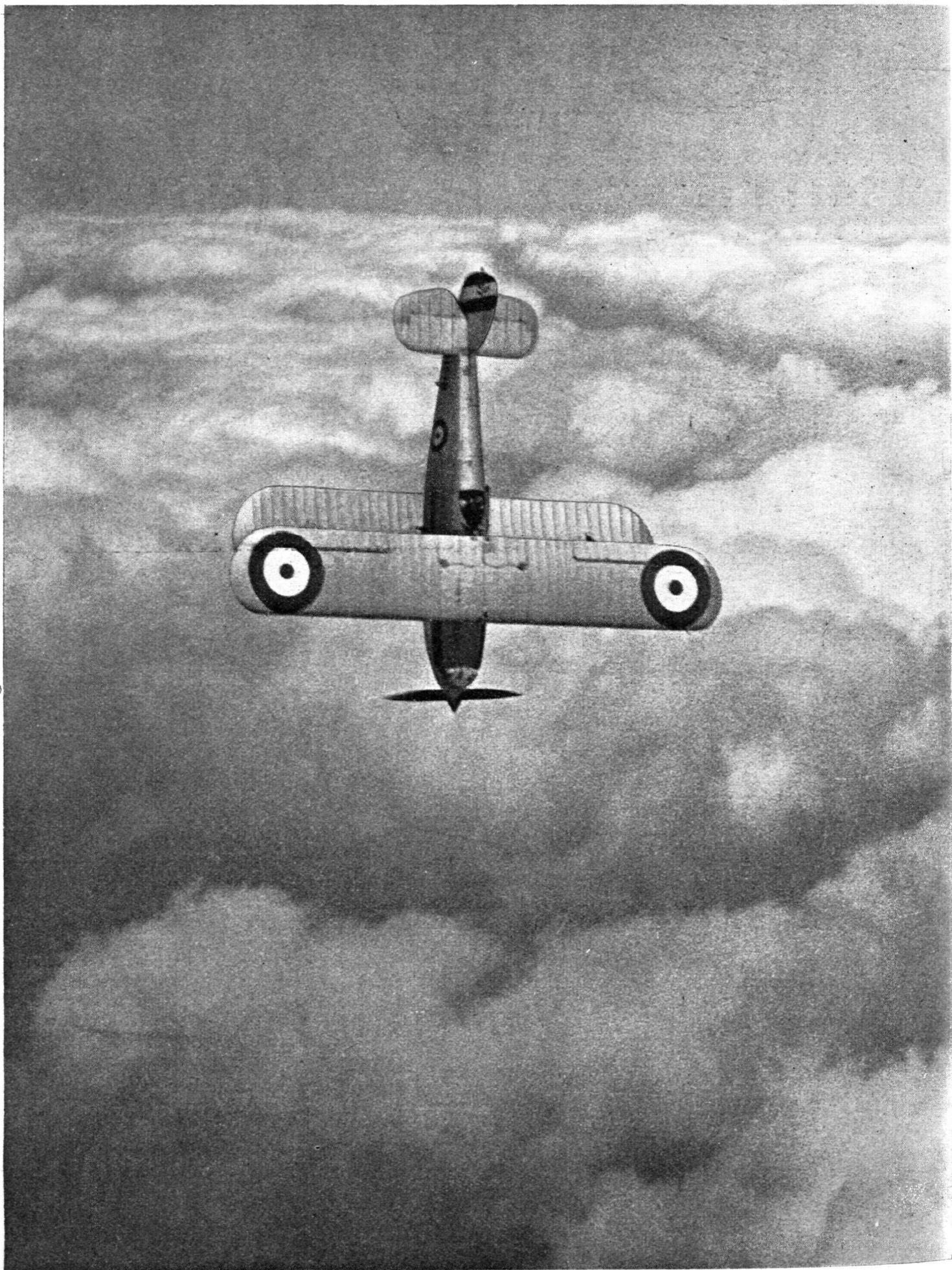
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"Flight" Photo

SECURITY.—A unique photograph taken by "Flight," showing the Hawker "Nimrod" piloted by Mr. Bulman just after commencing a T. V. dive. This is one of the many rigid tests to which Hawker aircraft are subjected both before and during Service.

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synchronise on the test-bench by running alternate magneto and adjusting timing until no fall in engine revolutions was noted.

When the engine has finally been assembled it is taken to the test-house and put on the Heenan & Froude dynamometer, referred to above. In the test-house provision is made for measuring petrol consumption on two dual flowmeters, which can be used singly, in tandem or in parallel, thus giving a cross-check on fuel consumption.

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The petrol and oil tanks used in the test-house are so arranged that for long continuous runs they can be replenished without interfering with the gauges or with the temperature. The various data taken during test-runs are given on report sheets, one typical sheet being reproduced in one of our photographs.

By way of an item of topical news, it may be mentioned that the cylinders of Mr. Ulm's Wright engines were re-ground by Airwork Engine Service, Ltd., before he started on his record flight to Australia.

## TECHNICAL LITERATURE

### "MARINE AIRCRAFT DESIGN"

HITHERTO there has been a lack of concise literature on the subject of the design of seaplanes and flying-boats. The subject is one of the very greatest importance to the British Empire, but it has not so far received the attention which has been showered upon the landplane, the reason presumably being that for every designer of flying-boats there are a dozen or more designers of landplanes. In research, too, the quantity of information available to the student or the designer who wishes to become familiar with the particular problems of marine aircraft is relatively small, and only to be found scattered throughout various Government and other publications. While it could scarcely be claimed that "Marine Aircraft Design," by William Munro, A.M.I.Ae.E., published by Sir Isaac Pitman & Sons, Ltd., and obtainable from FLIGHT Offices at 20s. 6d., post free, provides complete information concerning all the difficult problems to be solved in the design of a flying-boat or twin-float seaplane, the book does serve as a very excellent introduction to the subject. Mr. Munro has had practical experience of marine aircraft design both in this country and in the United States, and is thus well equipped for compiling such a book. Some of his work will be familiar to our readers from articles published in THE AIRCRAFT ENGINEER, but the book contains a great deal of material not previously published, or at any rate not readily accessible. Mr. J. Laurence Pritchard, Hon. F.R.Ae.S., Secretary of the Royal Aeronautical Society, has written a foreword to the book, in which he calls attention to the part which marine aircraft are bound to play in the future of the British Empire. He points out that the book is eminently practical, a book written by an engineer.

"Marine Aircraft Design" is divided into two sections, the first dealing with flying-boats and the second with floatplanes. In between them is sandwiched a chapter on Wing Design by B. S. Shenstone, M.A.Sc., A.F.R.Ae.S.

The general principles of hull design are dealt with first, and then the reader is carried by stages through strength of hulls and hull construction to stability of flying-boats on the water. A somewhat similar scheme

has been followed in the section dealing with floatplanes. A set of data sheets completes the book.

Under the chapters dealing with the strength of hulls and floats, a useful guide is given to the gauges of sheet used in various parts of the hull, and which experience has shown to give the necessary rigidity. The calculation of metal-skin hulls is still a long way from being an exact science, and experience and common sense must be relied upon to bridge the many gaps in our knowledge. "Porpoising" is a vice which many seaplanes and flying-boats have been found to have in the past, and the subject is of such a complicated nature that there is no hope of being able to calculate beforehand the behaviour of a flying-boat under any of the varying conditions which it may be called upon to meet. Possibly that is why Mr. Munro has made no attempt in his book to explain "porpoising," and, in fact, merely refers to it in passing. The phenomenon is not even included in the index. It seems a pity that Mr. Munro has not devoted a few pages to this subject. No one would expect him to produce formulæ guaranteed to prevent porpoising, but the reader is entitled to expect a statement of the general nature of porpoising, the features which tend to produce it, and the design remedies which have been found to reduce it.

Apart from the sketchy treatment of fore-and-aft stability on the water, the main criticism which can be levelled against the book is that it appears to favour, by the mass of details, if not by actual statement, the type of hull which has straight-line sections in the body plan. This type of hull is by no means typically British, and one suspects that the author has been led to include so much material dealing with this type because he became familiar with it during his connection with the design of the Towle amphibian in America.

In spite of the shortcomings indicated, "Marine Aircraft Design" is a book which should serve to give the student and the designer without previous experience of marine aircraft design a very sound, if not quite complete, insight into the mysteries of the combined arts of the aircraft designer and the naval architect.

## SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any Bookseller.

**APPLICATION OF A METHOD FOR DETERMINING THE STRESSES IN BRACED FRAMEWORKS.** By L. Chitty, A.F.R.Ae.S. R. & M. No. 1528. (36 pages and 2 diagrams.) October 12, 1932. Price 1s. 9d. net.

A tubular framework, consisting of longitudinal and crossed diagonal members connected by pin joints to a series of radially braced transverse frames (or bulkheads), may present a highly redundant structure if all the members are capable of withstanding both tensile and compressive forces.

When such a structure, consisting of several bays, is subjected to external loads acting at the joints of the terminal bulkheads, strain energy methods for determining the stresses in the members are out of the question, and other methods hitherto suggested have involved restricting assumptions either (a) as to the distribution of the total applied load among the joints of the terminal bulkheads,\* or (b) as to the rigidity of the bulkheads throughout the tube.†

In a paper to the Royal Society,‡ Professor R. V. Southwell has now outlined a general method for determining the stresses in the members of such a structure when the external loads (or the displacements) at the joints of the terminal bulkheads are specified in any arbitrary manner, and this method involves no restricting assumptions as to the rigidity of the bulkheads.

In the first part of the present paper this method is applied to a particular structure—the fully braced hexagonal tube which was constructed and tested

\* R. & M. 791. "On the determination of stresses in braced frameworks." Part III.—R. V. Southwell.

† R. & M. 1427. "Primary stresses in the hull of a rigid airship."—L. Chitty and R. V. Southwell. See also R. & M. 800, Appendix V, for a particular case.

‡ Proc Roy. Soc. A, Vol. 139, 1933. "On the calculation of stresses in braced frameworks."—R. V. Southwell, F.R.S. (R. & M. 1526.)

by Professor A. J. S. Pippard and J. F. Baker and described by them in R. & M. 948, experiment No. 4.

In Part 2 it is assumed that an arbitrary system of loads or displacements (but not a mixture of both) is specified for either terminal bulkhead.

The method consists in analysing the given system into a series of component "type systems," in each of which the displacements of the joints throughout the tube have definite values, dependent on the elastic properties of the members. The amplitudes of these component type systems are first evaluated; the displacements of all the joints in the structure under the given system are then obtained by synthesis. Finally, the stresses in the members are deduced.

**THE POSSIBLE INCREASE IN LEVEL SPEED OF HIGH-SPEED AIRCRAFT CAUSED BY A DIVING START.** By H. M. Garner, M.A., and R. K. Cushing. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1530. (4 pages and 7 diagrams.) December 1, 1932. Price 4d. net.

The rules for speed records allow the aircraft to dive from a certain height before starting the run along the course. By taking advantage of the dive, the pilot can start the run at a speed much in excess of the true level speed of the aircraft. The drag of modern high-speed aircraft is so low that for these aircraft the excess of speed retained up to the end of the run is appreciable and the average speed over the course is thus considerably greater than the true level speed. The object of the present report is to calculate the maximum increase in speed which can reasonably be obtained by the pilot.

A possible gain of speed for the S.6.B. in the dive of  $42\frac{1}{2}$  ft. per second and of  $24\frac{1}{2}$  ft. per second along the course may be obtained without excessive accelerations. To obtain these results a very high standard of skill on the part of the pilot is required. On the second speed record on the S.6.B. Flight Lieutenant Stainforth obtained a gain of speed along the course of an amount which agrees with the theoretical value to the order of accuracy of the measurements.

**THE VORTEX SYSTEM GENERATED BEHIND A SPHERE MOVING THROUGH A VISCOUS FLUID.** By H. F. Winny, Ph.D. Communicated by Dr. N. A. V. Piercy. R. & M. No. 1531. (14 pages and 12 diagrams.) September 19, 1932. Price 1s. net.

The wake of a sphere was investigated in various ways. Visual experiments preliminary to the present investigation showed the wake to contain a vortex system of spiral arrangement. Hot-wire methods were used to determine the frequency and pitch of the helical disturbance. The average velocity distribution through the wake indicated a concentration of vorticity at a radius greater than that of the sphere. Readings of the average angle of downwash revealed a weak axial vortex, but no circulation round the wake. An electrical condenser in conjunction with an amplifier and oscillograph was applied to give information as to the fluctuating pressures on the surface of the sphere, and this was supplemented by measurements of average static pressure and total head.

The work is incomplete to the extent that the exact form of the spiral system is not determined, but investigation on the present lines of the wake of other solids of revolution would nevertheless be of interest: in particular, the case of the airship. The condenser-oscillograph method of measuring fluctuating pressures on a surface proved satisfactory, and might with advantage be developed for general use.

**DETERMINATION OF THE BEST BASIS OF AIRCRAFT PERFORMANCE REDUCTION FROM FLIGHT TESTS. PART I. SUPERCHARGED ENGINES.** By J. L. Hutchinson, B.A., and E. Finn, B.Sc. **PART II. UNSUPERCHARGED ENGINES.** By E. Finn, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1532. (16 pages and 27 diagrams.) September 26, 1932. Price 2s. 3d. net.

The previous determinations of the power law of supercharged engines indicated a surprising disparity between moderately and fully supercharged types. These results were, however, drawn from the rather slender evidence of a few early flight tests with supercharged engines. A large amount of additional information has now been accumulated from routine performance tests, and it was decided to re-investigate the problem.

Tests over a sufficiently wide temperature range were available on 16 aircraft when the following conclusions were reached. The original disparity between the results for moderately and fully supercharged engines is not confirmed. The weighted mean law for both types conforms closely to  $p^{\frac{1}{2}}\sigma^{\frac{1}{2}}$ . Variations of the law from pure pressure to pure density have been found, in particular instances, but as these variations may in some degree be due to errors of measurement, particularly when data is limited, they are not necessarily real.  $N\sqrt{\sigma}$  appears to be a more reliable criterion than  $V_c\sqrt{\sigma}$ , possibly because  $N$ , unlike  $V_c$ , is unaffected by steady up and down currents.

In the second part of the paper, all the available evidence covering a sufficiently wide temperature range including some of the data used for a previous report on this subject has been analysed and the best basis of reduction deduced for each aircraft separately. The reliability of the results obtained in each case has been assessed and the weighted mean law extracted from the results.

The following conclusions are drawn:—

(i) The weighted mean law for unsupercharged engines is very near to  $p^{\frac{1}{2}}\sigma^{\frac{1}{2}}$ , the best mean law found for supercharged engines in Part I and is the power law indicated by bench tests and used in the correction of bench tests results to standard conditions (Reference 6). This agrees fairly well with the result  $p^{\frac{1}{2}}\sigma^{\frac{1}{2}}$  previously found (4 and 7).

(ii) The limits of the law in extreme cases are from pure pressure to pure density, but this variation is not necessarily real as explained in Part I.

(iii) The work confirms the conclusion of Part I that  $N\sqrt{\sigma}$  is a better criterion of the basis of reduction than  $V_c\sqrt{\sigma}$ .

**THE INFLUENCE OF END FIXING CONDITIONS AND OF BULKHEAD WIRES UPON THE LOADS IN THE MEMBERS OF**

**AN AEROPLANE FUSELAGE UNDER COMBINED BENDING AND TORSION.** By G. W. Mullett, D.I.C., Whitworth Scholar. Communicated by Prof. L. Bairstow. R. & M. No. 1533. (30 pages and 10 diagrams.) April 28, 1933. Price 1s. 6d. net.

A particular fuselage is stressed for three conditions of support at the forward bulkhead and the loads so obtained compared. Since it was also desired to determine the effect upon the internal load distribution of ignoring intermediate bulkhead wires, each of the three sets of stressing calculations, for the particular fuselage above, was based first on the assumption that all bulkhead wires were operative and then on the assumption that the intermediate bulkhead wires could be ignored. It then became necessary to consider the supporting forces which were assumed to act at the forward bulkhead of the fuselage for the purposes of these stressing calculations.

It was found that the internal loads in the particular fuselage structure considered are sensitive to end fixing conditions but are comparatively little affected by the omission of intermediate bulkhead wires. The effect of any axial constraint at the forward bulkhead is relatively small, when support is assumed at only two corner joints, so that, in this latter case, any warping which may occur in the forward bulkhead may seriously affect the loads in the members near the front of the fuselage. Finally, the effect of any constraint in the plane of the forward bulkhead is, in general, confined to the members composing the bulkhead.

**ON THE EFFECT OF STIFF RIBS ON THE TORSIONAL STIFFNESS OF AEROPLANE WINGS.** By H. Roxbee Cox, Ph.D., D.I.C., B.Sc., and D. Williams, B.Sc., A.M.I.Mech.E. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1536. (18 pages and 3 diagrams.) January 5, 1933. Price 1s. net.

The torsional stiffness of an aeroplane wing with two or more spars is very considerably under-estimated if, in its computation, the influence of the ribs is ignored. If the spars have any appreciable inherent torsional stiffness and are well connected by ribs stiff in their own planes, any differential movement of the spars is accompanied by twisting of the spars, thus bringing into play their torsional stiffnesses. If the ribs are capable of resisting torsion a further restriction is imposed on the distortion of the spars. If actual ribs combine both flexural and torsional stiffness, then the effects described will be simultaneous.

These questions are treated from a theoretical standpoint and illustrated by numerical cases.

The general inferences of the work are:—

To obtain maximum wing torsional stiffness—

- (a) the torsional stiffness of the spars should be as great as possible, compatible with their flexural moduli;
- (b) the spars should be joined together near the wing-tip by a rib very stiff in its own plane;
- (c) if the spars are tapered appreciably, this should be augmented by adding one or two more ribs stiff in their own planes in the taper region;
- (d) as many ribs as possible should be designed to have high torsional stiffness, especially in the tip region;
- (e) all ribs should be firmly attached to the spars.

These conclusions have been arrived at by consideration of a two-spar wing. They are, of course, valid for a multi-spar wing. They indicate, among other things, that the low degree of torsional stiffness frequently associated with large two-spar, fabric-covered monoplane wings is a disability which might be satisfactorily overcome without recourse to a less orthodox type of construction.

**THE EFFECT OF THE RIBS ON THE STRESSES IN THE SPARS OF A TWO-SPAR WING SUBJECTED TO THE MOST GENERAL TYPE OF LOADING.** By D. Williams, B.Sc., A.M.I.Mech.E., and H. Roxbee Cox, Ph.D., D.I.C., B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1538. (12 pages and 6 diagrams.) January 17, 1933. Price 1s. net.

It has been shown in Refs. 1, 2, 3 and 4\* that in a wing in which the spars, by virtue of the shape of their cross-sections (e.g., "box" section spars), are efficient individually in resisting torsion, the stiffness of the wing as a whole against torsion depends to a great extent on the stiffness of the ribs. When the ribs are stiff in their own planes and firmly connected to the spars, the wing torsional stiffness added by means of the ribs to that inherent in the bending stiffnesses of the spars is considerable. Further wing torsional stiffness is added if the ribs are torsionally stiff.

A large number of aeroplane wings have spars of the kind just referred to, and it is found that many embody ribs sufficiently stiff in their planes and sufficiently well connected to the spars for neglect of the rib effect to give a serious underestimate of torsional stiffness. The torsional stiffness of ribs are not however at present usually such as to have an appreciable effect in torsional stiffness calculations.

In the present report the general case is considered in which the spar sections and the aerodynamic loading vary along the span. The rib-effect is of the nature of a "relief" the magnitude of which is illustrated by a numerical example on a typical single-bay biplane top wing subjected to conventional C.P. forward, C.P. back and nose-diving loadings.

An example indicates that in designs incorporating stiff ribs rigidly connected to the spars, this relief is appreciable. Its magnitude increases with the ratio of torsional to flexural loading on a wing.

\* Ref. 1. "Cases of purely torsional loading on stripped aeroplane wings," by H. Roxbee Cox. R. & M. 1436.

Ref. 2. "Distortions of stripped aeroplane wings under torsional loading," by D. Williams. R. & M. 1507.

Ref. 3. "On the effect of stiff ribs on the torsional stiffness of aeroplane wings," by H. Roxbee Cox and D. Williams. R. & M. 1536.

Ref. 4. "Experiments on the distortion of a stripped metal wing under torsional loading," by D. Williams and H. F. Vessey. R.A.E. Report No. A.D. 1603/2F (Unpublished).

# Air Transport

## TASMANIAN AIR SERVICES

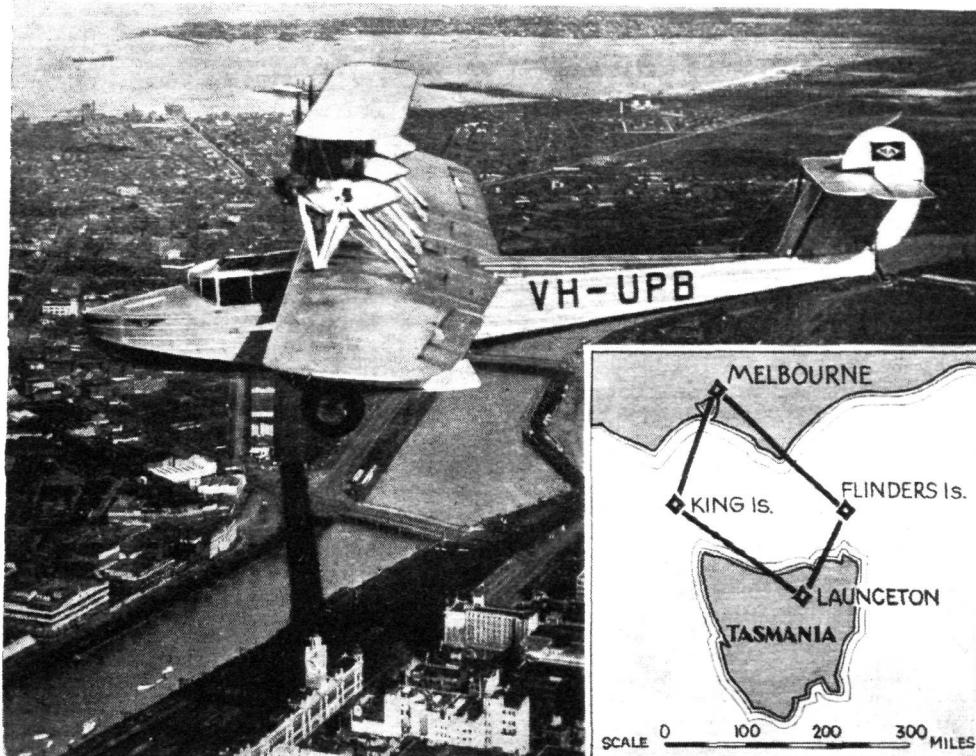
**A**LTHOUGH an air service between Australia and Tasmania is undoubtedly very desirable in view of the fact that the 200 or so mile crossing by boat takes about 18 hours—sometimes under very uncomfortable conditions—while by air it takes only four hours, a regular air service has not up to now materialised.

Previously, the Australian National Airways operated a service between Melbourne and Launceston, but since this company went into liquidation there has been no regular air mail between Victoria and Tasmania.

Some time ago the Hart Aircraft Company of Melbourne purchased a three-engined Avro-X monoplane from the liquidators of Australian National Airways, christened it the *Tasman*, and this has been used for some months in a passenger service from Melbourne to Launceston.

At the same time the Matthews Aviation Service, another Victorian Aircraft Company, have also been operating a passenger service over the Bass Strait, and they have used a Saro "Windhover" amphibian, equipped with three "Gipsy II" engines.

Both companies recently arranged with the Postmaster-General's Department to operate conjointly an air-mail service between Melbourne and Launceston. The first flight was made on August 22 and was carried out by the Hart Aircraft Company's *Tasman*. The return flight was made the following day, August 23, and on the 25th the Matthews Aviation Company's amphibian continued the service, returning on the 26th.



**AMPHIBIOUS** : The Saro "Windhover" amphibian (three "Gipsy II") leaving Melbourne en route for Launceston via King Island.

These two companies now operate regular air-mail services between Melbourne and Launceston, the Hart Aircraft Co. operating via Flinders Island, and Matthews Aviation Co. via King's Island. The services are scheduled as follows:—Via Flinders Island: Leave Melbourne Tuesdays, 9.30 a.m., arriving Flinders Island 1 p.m. and Launceston 2.45 p.m. Leave Launceston Wednesdays, 9.30 a.m., arriving Flinders Island 11 a.m. and Melbourne 2.45 p.m. Via King's Island: Leave Melbourne Fridays, 8 a.m., arriving Launceston 2.30 p.m. Leave Launceston Saturdays, 8.30 a.m., arriving Melbourne 2.45 p.m. At present, King's Island will not figure as a regular stopping place owing to the condition of the landing ground.

The new air-mail service is being operated on the standard air-mail surcharge of 3d. per  $\frac{1}{2}$  oz., and if the passenger



**ON TASMANIAN SERVICE** : The Avro "Ten" operated by Hart Aircraft Co., Ltd., on their Melbourne-Launceston service flying over Melbourne. The Hart Aircraft Company, whose offices and hangars are located at Essendon Aerodrome, Melbourne, operate as well as the Melbourne-Launceston service, a general aircraft engineering service, a taxi service throughout the Commonwealth of Australia and a school of aviation. Their flying equipment consists of the Avro "Ten" (three-engined monoplane), a Desoutter ("Gipsy Mark III" engine), a "Hawk Moth" with a geared "Lynx" engine, and two "Gipsy Moths." (Photo, courtesy Vacuum Oil Co., Ltd.)

bookings develop as expected, the frequency of the service will be increased.

The Hart Aircraft Company, in the *Tasman* and all other planes operated by them, use exclusively Plume Motor Spirit and Mobil oil; and the Matthews Aviation Company use Mobil oil exclusively.

We believe that Tasmanian Aerial Services, of which Capt. V. C. Holyman is Managing Director, have been operating a passenger service between Launceston and Flinders Island, and recently bought a 10-seater machine, with which they hope to extend their activities. So things are looking up in Tasmania.

## THAT GREENLAND AIR ROUTE

**L**COL. LINDBERGH has studiously avoided allowing himself to be quoted in the Press during his visit to this country. On October 19, however, Mr. Wilson Cross, Chairman of the Vacuum Oil Co., Ltd., which firm has serviced Col. Lindbergh's flight, prevailed upon him to meet our friends Mr. E. C. Shepherd and Maj. C. C. Turner, aeronautical correspondents of *The Times* and *Daily Telegraph* respectively. Under Mr. Wilson Cross's, and his co-director, Mr. Gordon England's, hospitality, Col. Lindbergh expressed views which are of great interest to those who look forward to the early establishment of an air route between the American Continent and Great Britain.

He opined that there would be little prospect of a service by the Greenland route until that route had been more fully surveyed under winter conditions. He was in agreement with the British expedition, which examined the route three years ago, as to its practicability in summer, given good ground organisation, efficient directional wireless and meteorological services. Also, with regard to the suitability of the lakes north of Angmag-salik for landing purposes. In this connection it is interesting to learn that the transition period between summer and winter covers only ten days, so that there should not be any undue dislocation of a service while waiting for the full winter freeze-up.

Water conditions, as he found them, apparently ruled out any question of forced landings, and multi-engined aircraft would there be a *sine qua non*.

As was pointed out in *The Times* leader, Col. Lindbergh is primarily a practical and technical official of Pan-

American Airways, and his views cannot therefore be taken as being prophetic of that company's ultimate policy. Moreover, it is certain that that company will not attempt to operate an Atlantic service for mails or for passengers unless they are assured of achieving regularity, and a time saving over surface transport, which would enable them to compete with the shipping lines.

The route in question also raises very important queries when it is compared to the direct route. The new flying-boats which Pan-American Airways has ordered will be able to make the direct crossing in spite of head winds, but only by carrying but a small pay load. The time taken would be cut to about 30 hr. between New York and London, but the rates charged would have to be very high. On the other hand, the longest stage of the Greenland route is only 660 miles; this would enable a higher percentage of pay load to be carried with a commensurate decrease in the rates; the time taken would, however, be much longer. If we are to judge by Imperial Airways' policy, and one which has admittedly been very successful, then we in this country should favour the large pay load and low rate system. The only alternative would be the short route, but with refuelling facilities in mid-ocean. It remains to be seen whether the German experiments with *Westphalian* are successful before that can be considered, although success in the Southern Atlantic by no means points to success being achievable in the North Atlantic.

In any case the establishment of an air mail route between the two continents will be eagerly awaited, but in the meantime we fully expect to see an all-British service established first between Great Britain and Australia.

## A London—Plymouth Service

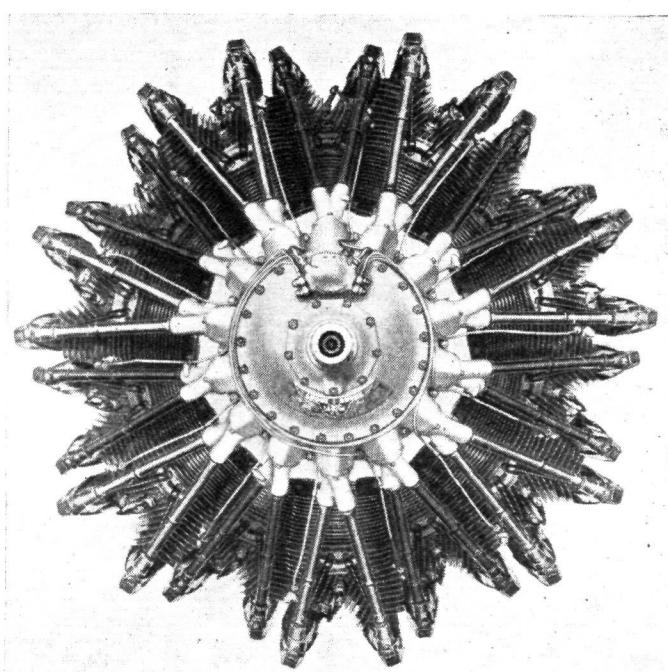
IN FLIGHT for October 19, under the New Companies Registered section, was the first announcement of a new company called Provincial Airways, Ltd. This has been formed to operate a service between London and Plymouth, calling in all probability at Southampton (Eastleigh Aerodrome). Flt. Lt. W. G. Pudney will be Air Superintendent, and Maj. H. Kent with Messrs. R. L. Bowes and S. J. Noel-Brown the Directors. The company at the present time owns a "Fox Moth" and a "Puss Moth," and is placing orders for about three "Dragons," which will be fitted with the Marconi Wireless Homing Device described in FLIGHT for May 18, 1933. This device will enable the pilots to fly accurately despite bad weather and to guide themselves direct to Plymouth even when they have to take a circuitous route.

## Air Service to Russia and the Baltic

As a result of the recent discussions at Moscow between Mr. D. J. de Vries, chief of the foreign department of the K.L.M., and representative of Russia, Sweden and Finland, the establishment of a regular air service between Leningrad, Reval, Helsingfors, Stockholm, Malmö, and Amsterdam, with connections to Paris and London, may be expected early in 1935. In an interview with the *Telegraaf* on his return to *The Hague*, Mr. de Vries said that in his opinion commercial flying in Russia was not yet of much significance. The number of commercial aeroplanes was small—at most 100 in all—and the ground organisation left much to be desired, especially at Leningrad. At the Moscow aerodrome each aeroplane was guarded by a soldier of the Red Army.



EN ROUTE FOR RANGOON : The *Athena*, of Indian Trans-Continental Airways, about to leave Calcutta, under monsoon skies, for Rangoon with the first Croydon air mails.



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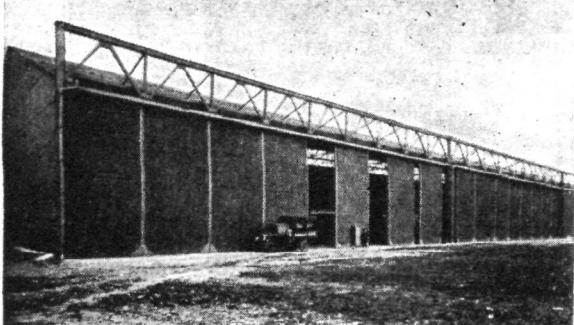
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XX

TAS/Cel. 94

# Airport News

## CROYDON

LAST week's most important event at the Airport of London was a meeting on Traffic Control called by the Air Ministry, and held in the Airport Board-room at 11.0 a.m. on October 19. Maj. Mealing was in the chair, and other Air Ministry representatives were Wing Com. Allen, Maj. Richard (Chief Aerodrome Officer) and Capt. Markham, of the Control Tower Staff. Mr. Sweeney attended as wireless adviser. All the air traffic companies were represented: Imperial Airways by Maj. Brackley and Mr. Wolley-Dod, Luft Hansa by Herr Schmidt-Rex, K.L.M. by Capt. Leverton and Mr. Aler, Air-France by M. Bajac, and Sabena by M. van den Eynde.

Satisfactory progress was made along the lines indicated in Maj. Mealing's recent lecture on the subject before the Royal Aeronautical Society, and, whilst full details of the discussion are not yet available, it is permitted to say that all companies agreed to the necessity of a Traffic Zone around Croydon within which aircraft in foggy weather should come under the strict control of the traffic officer on duty in the Croydon Control Tower.

A notable feature of this meeting, which marked a step forward since a similar discussion two years ago, was the helpful attitude of the Royal Air Force, whose representative promised close co-operation from Service aircraft flying on the Croydon-Continental air routes.

Last Sunday was one of the days when early fog made visibility almost nil at Croydon, but when the rest of the routes were quite flyable. Machines which left early took off along the white chalk line and, although we at the airport are accustomed to this practice, it must be a curious experience for passengers to rush along the ground and take off with no view from the windows but swirling clouds of grey vapour.

Some ill-advised newspaper man took the opportunity to write a scare article under the heading "Fog Disorganises Cross-Channel Air Traffic" merely because some pilots wisely put in at alternative ports, and even operated services outwards again from those ports. Actually, Sunday was an example of good and safe air traffic organisation on a day when the Airport of London itself was very difficult to get into.

Capt. W. A. Rollason, who is well known at Croydon, has formed a company known as "Rollason Aircraft Services." This is not a flying concern, but has as its objects the service, repair and maintenance of all types of aero-engine and aircraft, the stocking of spares, equipment, and accessories, the sale of aeroplanes and engines, and the purchase and shipping of aircraft and engines to customers abroad. The company has recently been appointed Croydon Agent for De Havilland aircraft and engines, and it is felt that a service dépôt of this sort has been badly needed at the Airport of London, especially for foreign visitors.

The well-known French airwoman, Mlle. Maryse Hilsz, arrived at Croydon from Le Bourget on October 17, flying a Farman type 190, F-ALUI, with three passengers. Mlle. Hilsz, it is understood, holds a commercial licence.

During last week Air-France was commissioned to supply an aerial "family cab" for M. Bracke from London to Paris. The party consisted of father, mother, nine children and a ton of luggage. M. Bracke is Dominican Minister in London.

Other notable Air-France passengers included Len Harvey, the boxer, the Austrian Ice Hockey Team last Monday, Borotra, the Tennis Star, and a Spanish gentleman named Primo de Rivera, believed to be son of the late Premier of Spain.

All companies report remarkably heavy bookings of passengers for the time of year. Sabena has had to duplicate many services on the Brussels-Cologne line, and last Friday Air-France was fully booked up all day. Royal Dutch Air Lines planes have been fully loaded, and Imperial Airways, Ltd., as is usual with that company, have run to capacity all the week. October, 1933, bids fair to beat all previous records for that month.

I forgot to mention that Mr. Aler, of the K.L.M., came across from Holland by one of the company's services and landed a few minutes before the 11.0 a.m. meeting on Traffic Control on Thursday, October 19. He left again by the service leaving Croydon for Holland at 1.15 p.m., and was in his own office in Amsterdam once more by 4.0 p.m.

A. VIATOR.

## FROM HESTON

THE Airwork School of Flying, with ten more days to run, is 38 per cent. up on the flying time recorded for last October. Baron von Wangenheim, an experienced pilot, is having a check-over on light aeroplanes, having flown only heavy aircraft. He is also taking advanced navigational instruction with Capt. Ferguson, to qualify for a "B" licence.

Billy Bennett, of Alexander and Mose on the B.B.C., left Heston on the 16th to fulfil an engagement in Dublin. The British Air Navigation Co. flew him in a "Gull," and fetched him back on Sunday, the 22nd, despite the weather.

Dr. E. H. Thierry and Mr. C. W. Bonnicksen, who have shared an aeroplane for five years, left Heston on October 18 for Morocco, via Gibraltar and Tangier.



THE ALTERNATIVE AIRPORT: Weather conditions were too bad on Sunday for this Imperial Airways machine to land at Croydon, and so it made Heston its port of call.

The volume of traffic at Heston is shown by a recent census taken on a normal week day, when 90 machines were counted on the aerodrome at one time, and 61 of these were garaged for the night.



## A New Venture

MRS. A. L. PATTERSON, a director of Patterson Air Traders, Ltd., who uses a Miles "Hawk" ("Cirrus III") for her business, has been appointed representative for Silvertown Lubricants. She will also represent the in-

terests of Wainwrights, for flying clothing, and the Williamson Manufacturing Co. for the Williamson Pistol Camera. Mrs. Patterson, who learnt to fly at the Phillips and Powis School at Reading, operates from Lympne aerodrome.

# Airisms from the Four Winds

## Bleriot Cup for Italy

THE Blériot Cup has been won by Capt. Scapinelli, in a Macchi C.72 machine fitted with a 2,800 h.p. Fiat engine. The course flown over was a triangular one, and the speed attained was 619.3748 k.p.h. (385.057 m.p.h.). The Blériot Cup is an international speed test for a challenge trophy which is worth just over £1,000, and will be won outright by the airman maintaining a speed of 1,000 k.p.h. (621.36 m.p.h.) for half an hour. M. Blériot's idea was that it should take the place of the race for the Schneider Trophy.

## Harmsworth Trophy

MR. T. O. M. SOPWITH is to attempt to wrest from America the Harmsworth Trophy, now that Sir Thomas Lipton is no longer alive to make another attempt. A new yacht is being built at Gosport. So where yachtsmen have failed an aircraft designer may, perhaps, succeed.

## Capt. Crawford Greene's Flight

CAPT. W. P. CRAWFORD GREENE, M.P. for Worcester, has arrived at Singapore on his flight to Australia.

## New Dutch High Speed Machine

A DEMONSTRATION of a new Pander mail carrying machine was given at Amsterdam on Sunday, October 22, in the presence of Sir Percy Mackinnon, the Chairman of Lloyds. The cruising speed of the machine is reported to be in the nature of 200 m.p.h., and it can carry over 1,000 lb. of mails.

## England to Australia Business Flight

ON Monday, October 23, Mr. H. Shaw left Croydon in a private aeroplane on a 40,000 miles business flight. He intends to fly by way of the Mediterranean, Iraq, India, Shanghai, Malaya, and the Dutch East Indies to Australia. At Melbourne the machine will be shipped to Durban, and Mr. Shaw will fly from there to Capetown, returning later to England by way of the West Coast of Africa.

## Egyptian Airmen at Lympne

A PARTY of 14 officers and men of the Egyptian Air Force have arrived at Hythe, Kent, for a course of flying before piloting new machines back to Egypt. The course

will be in the charge of Sqd. Ldr. Tait, and will be held at Lympne, with Flt. Lt. Webster as chief instructor.

## Birmingham Airport

THE Birmingham City Council have authorised the General Purposes Committee to acquire a site for a municipal airport of about 300 acres. The proposed site has a frontage on the London-Birmingham road, and is about 7 miles from the centre of the city. So the second largest city in England is at last to have an airport, well good old Brum always was noted for its conservatism.

## Air Marshal Balbo Indisposed

AIR MARSHAL BALBO is reported to be seriously indisposed at Ferrara.

## Soviet Armada for France

A SOVIET Armada of 70 troop-carrying machines is to visit France. The Polish Government has given permission for the machines to fly over Polish territory.

## Grant for Kingsford-Smith

TWO PROPOSALS are before the Australian Government, with regard to Sir Charles Kingsford-Smith, one to make him a grant of £5,000, the other to give him a permanent position in the Commonwealth Service.

## Mr. W. H. Rhodes-Moorhouse

MR. W. H. RHODES-MOORHOUSE, who is a son of the late Capt. W. B. Rhodes-Moorhouse, V.C., the pioneer pilot, has just inherited an estate of a quarter of a million pounds, by a decision of both Divisions of the Appeal Court. Young Mr. Rhodes-Moorhouse gained his pilot's licence in 1931, at the age of 17.

## Royal Escape by Air

OWING to trouble in Siam the King and Queen have fled from their palace to Singora, which is near the frontier. The journey was made by air.

## The Bristol "Perseus"

IT has now become permissible to refer to the sleeve-valve engine produced by the Bristol Aeroplane Co., Ltd., and the development of which has been going on, first on single-cylinder units and afterwards as a complete engine. The "Perseus," as the new type will be called, is generally



FOR THE BYRD ANTARCTIC EXPEDITION : The Curtiss-Wright "Condor," in which Admiral Richard E. Byrd will fly over the South Pole, flying over New York City. It is powered by two 700 h.p. Wright "Cyclone" engines, has a top speed of 170 miles an hour and a landing speed of 45 miles per hour.

**AERIAL ADVERTISING IN HOLLAND** : A D.H. "Moth" ("Gipsy III"), with Dutch registration mark, used for advertising "Mercedes" cigarettes—which was written on the lower plane and also trailed out behind on a banner. Several flights have been made over Holland.



similar to the now-famous "Pegasus" in that it is a nine-cylinder radial air-cooled, but sleeve valves have been substituted for the poppet valves of the older engine. With master rod big-end troubles a thing of the past, the limiting factor in getting more and more power from an engine of given capacity by increasing the speed may well be the poppet valves and their gear, and it is possible that the introduction of the sleeve valve will raise considerably the power obtainable. The Bristol "Perseus" passed its type tests some time ago, and will now be thoroughly tested in the air.

### R.A.F. West African Flight

THREE Vickers Victoria machines of No. 218 (Bomber Transport) Squadron left Heliopolis on Saturday, October 14, for a flight to Bathurst, Gambia, and return. The route will be by way of Nigeria, the Gold Coast, and Sierra Leone, a distance of about 11,700 miles.

### A Pobjoy gets Three World's Records

EARLY this month a Pobjoy "R" engine helped a French machine and two French pilots to establish three new world's speed records for light planes in the 3rd category (two-seaters with tare weight not exceeding 280 kg., or 616 lb.). The machine was a Farman low-wing cantilever monoplane, type F.239, and the pilots were MM. Baily and Reginensi. The measured speed course was based upon Etampes, and the distances were 100 km. (62.12 miles), 500 km. (310.686 miles) and 1,000 km. (621.37 miles) respectively. The average speeds put up were 212.139 km./h. (131.8 m.p.h.), 200.3 km./h. (124.46 m.p.h.), and 195.756 km./h. (121.63 m.p.h.) respectively. It is interesting to recall that the 100 and 500 km. records were previously held by two Italian pilots on a machine also fitted with the Pobjoy engine, while the 1,000-km. record is the first to be established. Baily and Reginensi, who have previously won fame by some very fine fast flights from France to Madagascar and Saigon (French Indo-China), next propose to attack the long-distance non-stop record for light planes in category 3, which at present stands to the credit of Italy at 886.677 km. (551 miles).

### A.P. 1208—A Correction

MR. METTAM has written to point out that some unfortunate errors crept into his extract from Design

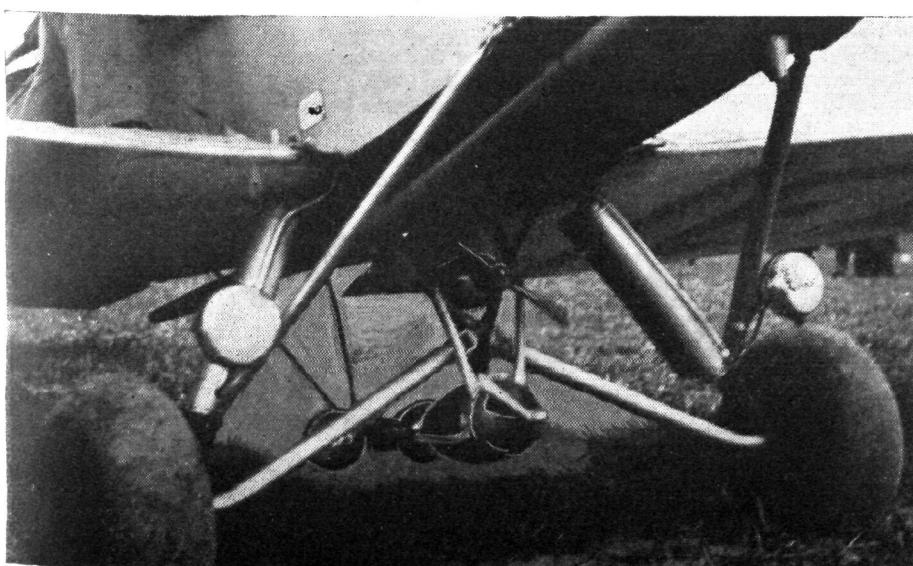
Leaflet B.1 in the article on British Airworthiness Requirements in last week's issue of FLIGHT. The errors were due to the fact that Mr. Mettam had quoted from an earlier issue of B.1. The changes which should be made by those of our readers who wish their copies to be accurate are as follows:—Paragraph 10: The second sentence should read: "In doubtful cases, appeal may be made to strength tests, *carried out under approved conditions*, either on complete units or on individual members." The words in italics were omitted. The third and fourth sentences should be deleted altogether. In the first sentence of Paragraph 11 the words, "the item tested," should have read "the item which fails in tests." An omission for which we ourselves must take the responsibility related to the graphs. In Fig. 1 of Mr. Mettam's article the new acrobatic factor for the C.P. Forward Case was, unfortunately, cut off. The value of this factor is 9 for all weights of aircraft.

### Turbine Aero Engines

IT is reported that a new type of aero engine, to operate in the stratosphere, is being designed by two Dublin engineers who, at the present time, refuse to allow their names to be published. Both, however, are well-known men with other valuable inventions already standing to their credit. In an interview with one of the designers, writes the Dublin correspondent of FLIGHT, he explained that the engine is to be of the impulse turbine type and operated by hydrogen, carried in liquid form. Experimental models have proved that the development of this principle is promising, and a working model of the engine is to be built. At the present time air cooling is contemplated and the engine has been designed with this in view; the problem of silencing the hydrogen explosions is also causing some difficulty. It was stated that the engine would be capable of producing a sufficient number of revolutions to rotate the airscrew without the use of gearing in the rarefied air of the stratosphere, although the designers intend to use a variable pitch airscrew when the engine is constructed and installed in an aircraft.

### The Royal Aero Club Monthly House Dinner

At the monthly House Dinner on Wednesday, November 1, at 8.15 p.m., the speaker will be Mr. C. R. Fairey. Lord Gorell will preside. Price of dinner, 4s.; dinner jackets. Members intending to be present are requested to send their names to the House Secretary beforehand.



**FESTOONED** : This undercarriage belongs to the "Moth" shown above, used by the Mercedes Cigarette Co., and was seen at the Heerlen Meeting in Holland. It has to carry four lights—two for landing, two for illuminating the lower plane—and two generators!

## SOUTH AFRICAN ENTERPRISE

HERE is in South Africa a young designer about whom the aeronautical world will probably hear more in the future. His name is Mr. C. J. Erasmus, and he lives at "Charlton," Somerset East. He was educated at Gill College in Somerset East, and on leaving school decided to break away from the family tradition of farming and devote his attentions to engineering, so he apprenticed himself to a local garage. His ambition to learn more of internal combustion engines led him to leave the garage and, in the year 1927, cross the ocean to America, where he took an extensive course in motor engineering and construction, passing his examinations with credit. After completing his engineering studies he began to realise the great possibilities of aviation, especially in his native land, South Africa, and so decided to devote himself to the study of aeroplane design. He became a student at the Michigan State University, and after graduating joined the Packard Co. (Aviation Branch). From there he went to Chicago, where he was connected with "Stromberg Devices," and later with the Aviation Service Transport, where he secured his Ground Engineering and Pilot's Certificates, also much practical flying experience.

Mr. Erasmus then decided to design and manufacture aeroplanes on his own and set up a small factory at Chicago, where he designed and built four "Erasmus" single-seater monoplanes powered by a three-cylinder radial engine of 35 h.p., also designed by himself. Having got so far he decided that he had outstayed his welcome, for the authorities required him to leave the country. Before leaving the States, however, he took part in a large aerial display using his own machine; unfortunately, he was involved in a collision with another machine, and crashed from a height of about 300 ft., receiving serious head injuries.

In 1931 he returned to South Africa taking with him quite a lot of machinery, and also arranged for a supply of constructional material. He decided to set up a factory at Somerset East and applied to the Municipality for a long lease of the local aerodrome, about two miles from the town, but for some reason or another his application was not granted. Not to be beaten by this little setback he repaired to his father's farm on the top of the Bush Berg range, 4,500 ft. above sea level. As there was not a supply of electricity at the farm, he set up his machinery in the village, and set to in an old shearing shed, to construct a monoplane as best he could. This he achieved with the sole assistance of his younger brother. To satisfy



Mr. J. C. Erasmus, whose small machines are described on this page.

the requirements of the Civil Aviation Board he had to work under licence from an American firm of standing, and certain features in the American design had to be incorporated, so the machine was not built strictly to his own design.

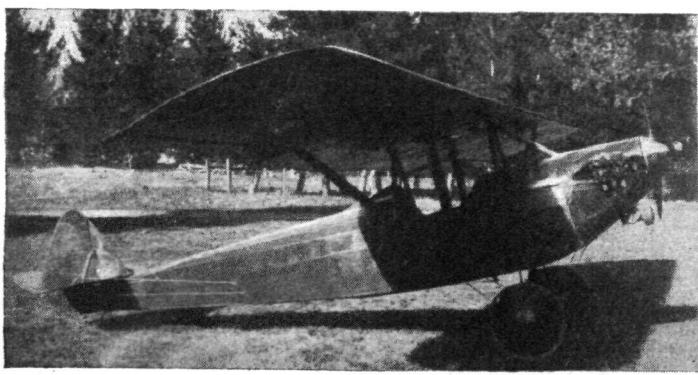
One day, a great one for Mr. Erasmus, the newly constructed machine was wheeled out into the open for a flying test. On the mountain top there is no level ground, so the young designer was compelled to make the best of the grassy slopes of the hillsides; by skill, however, and perhaps a little good luck, which is after all only the fair deserts of the brave, he successfully carried out a first flying test, soaring away over the crest of the mountain and circling over the town at a height of over 3,500 ft. above it.

The machine is a single-seater high-wing monoplane; the wings, 26 ft. spread, are of wooden frame construction, covered with fabric; the fuselage is constructed of high-tension aeroplane steel tubes, oxygen-acetylene welded; the engine, four-cylinder horizontally opposed, develops 40 h.p., and gives the machine a speed of 100 m.p.h.; the petrol consumption is 2 gal. an hr., the rate of climb 800 ft. per min., the take-off 60 yd., the landing speed 30 m.p.h., and the total weight, fully

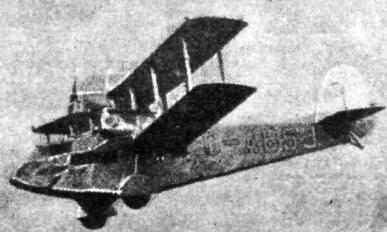
loaded and including pilot, 700 lb.

Mr. Erasmus then applied for a Certificate of Airworthiness, which could only be granted by the authorities at Pretoria, nearly 700 miles away. Meanwhile, Mr. Erasmus sold the machine to a rancher subject to it being granted a C. of A.; there was, however, some little delay in getting it inspected. After a time Maj. Miller, D.S.O., Chairman of South African Airways, came to Somerset East and inspected the plane. After a thorough examination he took it up on a trial flight, and was so impressed that he flew it to Port Elizabeth, 100 miles distant, and from there to Cape Town, where it created great interest; afterwards he flew it back to Port Elizabeth, stating emphatically that it was an ideal machine for the conditions in South Africa. When the machine was, once again, at Port Elizabeth the authorities, not understanding that the wheels had been set at an angle by design, thought that the tubular axle was bent; they therefore removed it and had it straightened by the local blacksmith, who failed to restore the original temper. Pilot W. Pidsley then flew the machine to its home at Somerset East, but, on landing, the weakened axle gave way. (Hardly surprising. We have seen blacksmiths at work. They may know something about footwear for horses, but when it comes to an aeroplane undercarriage—well, you can hardly blame the blacksmith. Brute force and—er—a certain amount of ignorance are not essential attributes for aircraft workmanship.—ED.)

Mr. Erasmus has since constructed a second light monoplane, slightly larger than the first, and has tested it out. He is very satisfied with its performance, but is disheartened by the lack of Government interest, and the



On the left is the first machine constructed by Mr. Erasmus in South Africa. His second effort is shown on the right.



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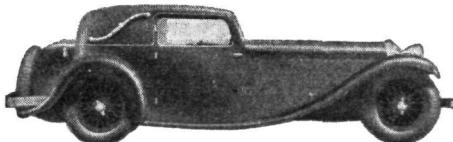
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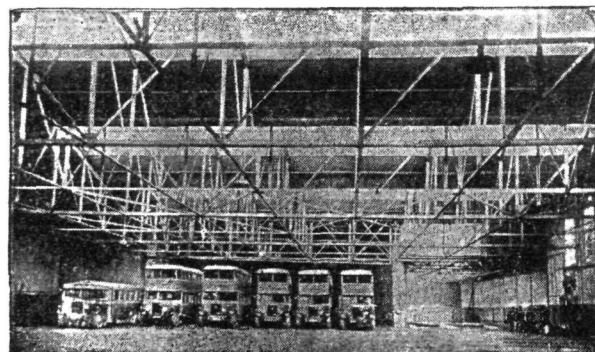
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many snags set by rules and regulations, which appear to make successful construction in South Africa almost a crime. Mr. Erasmus states definitely that, given sympathetic support from the Union Government, he is willing to erect the first South African aeroplane factory. He neither asks for, nor requires, financial support from them.

(Mr. Erasmus may take comfort from the fact that most of the leading aeroplane constructors in Great Britain have also felt like he does at some time or other. They have, however, persevered and are reaping their reward. Rome was not built in a day. The greater the difficulty, the greater the glory.—ED.)  
A. D. B.



## THE FARMAN 390

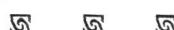


### A Cabin Machine for Pilot and Three Passengers

**F**ARMAN BROS. have recently produced a new Cabin Monoplane, called the Farman 390. It has been designed to incorporate the improvements derived from the experience gained by the Farman 190, and to furnish the maximum comfort for tourist flying.

It is a high-wing monoplane capable of carrying three passengers. The fuselage is constructed of wood covered with plywood. The cabin is 7 ft. 9 in. in length, 3 ft. 4 in. in width, and 4 ft. 9 in. high; it is fitted with a skylight and a large lateral sliding window on each side. One of the passengers' sits beside the pilot on a swivel seat and the other two behind, side by side. The walls of the cabin are lined with a specially prepared light rubber material, of about an inch in thickness, which deadens the noise of the engine and allows the passengers to converse without inconvenience. The cabin is also cooled by a series of intakes leading from the wings, and can be warmed in cold weather by pipes heated from the exhaust.

The wings are constructed of wood and covered with fabric. They are joined on each side to a centre section, which forms part of the roof of the cabin, and they are braced in addition by oblique struts, two on either side, attached to the lower part of the fuselage. These struts are constructed of duralumin and encased in a streamlined covering of wood. The fuel tanks, of a capacity of 30 gall., are installed in the wings. The undercarriage is of semi-cantilever construction composed of duralumin struts, also encased in streamlined coverings and fastened to the wing struts and the fuselage. It has a track of 9 ft. 9 in., and is fitted with Farman oleo-pneumatic shock absorbers. The wheels, which are covered with fairings, are equipped with brakes and low-pressure balloon tyres.



### "Safety Last"

AN interesting difference in the point of view of the Americans and the English, and one which accounts for the difference in the way in which the transport aeroplanes of the two countries have developed, was given us the other day. A well-known American pilot, who has had considerable experience of transport work, said that in his country it was impossible to sell safety. People would willingly pay more if there was the possibility of them being able to boast afterwards that they had done a journey in a few minutes less than their friends. That is why American operators do not mind sacrificing many pounds of pay-load if, by doing so, they can secure a little more speed. Over here it is different. People who travel by air set a higher value on comfort and safety than they do on speed, and although the service must, of course, be faster than any other form of transport, yet that factor undoubtedly takes second place to those of safety and comfort. The result has been Imperial Air-

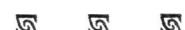
The 390 has been designed so that it can be equipped with either the new Farman 150-h.p. seven-cylinder engine, or the 220-h.p. nine-cylinder. The valves and rocker arms of these engines are covered with hoods which prevent the oil spray being thrown against the cabin windows or the pilot's windscreens. A four-bladed propeller fitted to a reduction gear (ratio 2-1) has been found to give the highest efficiency. The petrol consumption of the machine, when fitted with either of these two engines, is about 12 gall. to the mile.

Length .. .. ..	32 ft. 6 in.
Wing spread .. .. ..	45 ft. 10 in.
Height .. .. ..	9 ft. 9 in.
Wing surface .. .. ..	422 sq. ft. 5 sq. in.
Weight (empty) .. .. ..	2,200 lb.
Weight (loaded) .. .. ..	3,520 lb.

Performance.	150 h.p. engine.	220 h.p. engine.
	m.p.h.	m.p.h.
Maximum speed .. ..	109	125
Cruising speed .. ..	92	109
Landing speed .. ..	31	31
Flight radius .. ..	750 ml.	

(The 220 h.p. engine weighs 132 lb. more than the 150 h.p. engine.)

R. C. W.



ways' policy of providing aeroplanes with a larger pay-load than that of foreign aeroplanes, and also with much greater comfort. No one who has flown in the cabin of one of their H.P. 42-seaters, a cabin which is quieter than the coach of the ordinary express train, can deny that it is the most comfortable way of travelling, and one which is gaining new adherents by the hundred every week.

### Strengthening Singapore

THE reason why No. 100 (Bomber) Squadron was not available to take part in the recent coast defence exercises is that the squadron was under orders to sail for Singapore, and its "Vildebeestes" were being packed up. At present the air units at Singapore are No. 205 (Flying Boat) Squadron ("Southamptons") and No. 36 (Torpedo-Bomber) Squadron ("Horsleys"). No. 100 B.S. is actually a torpedo-dropping unit, though it has not yet been granted the name of a T.B. squadron. Perhaps this distinction will follow its transfer to the Far East Command.

# Correspondence

*The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.*

## THE PIONEERS OF FLYING

[2882] In the letter *re* "The Pioneers of Flying," I think your correspondent makes some very thoughtless and sweeping assertions, especially in connection with record breakers. Most flying people are considerably amused with the somewhat hysterical publicity that seems to fall to the lot of one or two well-known pilots, especially as they are lining their pockets very satisfactorily in the process. But, nevertheless, there are others—most decidedly there are others.

There are those who fly because they enjoy flying, and who try for records, etc., because they think they are worth trying for, and who very often are people of moderate means only, and who, if they did not get publicity, and sell their advertising, etc., would not be able to fly at all.

To class all people who try to do something out of the ordinary rut under the same heading is most unfair, merely because one or two people do not know when they have had enough fuss made about them.

As one of the boys of 18, I do not see any particular merit in taking up a machine after only two hours' dual, when one is ordered to, any more than being ordered over the top against uncut barbed wire.

There would, however, have been much merit if the "red tabs" who thought out these orders carried them out themselves; this, unfortunately, was "never done."

Harrogate.  
October 20, 1933.

H. L. B.

[2883] Your lady correspondent, Enid Greenwood, gives voice to an objection which many feel who knew something of the accomplishments and the difficulties of the pioneers of aviation.

Whilst she may derive some little consolation from this knowledge that she is not alone, the cause of the irritant is still with us, and will remain so until the education of the general public, *and that of the lay Press*, has caught up with the progress of aviation.

The "famous and wealthy record-breakers" of to-day are loaded with riches and lauded with pomp merely because the flood-lights of modern publicity, operated in the interests of commercial undertakings, throw into inflated prominence the personalities of the chief actors as a lead-in for the other issues of the show.

Newspapers, even those which have done good work for aviation in many directions, are very largely responsible for exploitation of its sensational side in the interests of "scoops" and circulations, and many of their organised stunts laid the foundations for the systematic hero culture of which your correspondent complains.

Harking back to 1911 and 1912, I have vivid recollections of aviation pioneers who did everything possible to prevent any public or Press knowledge of their activities, fearful lest they brought about their ears a motley crowd of souvenir hunters armed with scissors and other implements with which to strip the linen from the spars and ribs so laboriously fashioned. Unknown, unsung heroes, these, who coaxed their creaking contraptions of cane and wire off the earth, with a *crash-em-and-build-em-again* spirit only to be found in the poorer gliding clubs of to-day.

Looking back to copies of FLIGHT of 1912, one gets the more sympathetic with Mrs. Greenwood's sentiments, and one wonders how long it will be before the lay Press, and through it the public, will come to accept modern aircraft in true perspective, and give a little of their praise to the less spectacular work of the men who design and build machines *so safe and sound that trained pilots can fly them a long way in a short time*.

As a reader of FLIGHT since 1911, I owe you a great debt for not only keeping me informed of the progress of aviation, but for helping to keep my own perspective clear while endeavouring to serve the interests of the lay Press on aeronautical matters.

E. G. SMETTEM.

London, W.C.2.  
October 23, 1933.

## THE YOUNGEST PILOT

[2884] A short time ago, in the daily Press, was an account of a young fellow of 16 flying solo; I can beat that record (if it is one). A young friend of mine flew solo at Ford Aerodrome at the age of 15, and, according to his instructor (Mr. Palmer), it was a wonderful show. The pupil's name is Jack Eric Lauderdale, of 27, Treen Avenue, Barnes, S.W.11. Can your records beat this?

C. DADSWELL.

St. John's Hill,  
London, S.W.11.

## REGULATION OF CIVIL FLYING

[2885] I doubt whether the possibilities visualised by Maj. Mealing are in accordance with the probable and logical development of aviation in this country.

He appears to assume that two things will happen, firstly, that aircraft will increase in speed and at the same time retain their present disadvantages, including an inability to slow down to a moderate speed in the air; secondly, that private aircraft will become comparable in number to motor-cars. I can see no reason to suppose that both of these two eventualities will occur; one or other of them might, but the mere occurrence of the first would be sufficient to prevent the occurrence of the second.

At the present moment it is an expensive hobby to be a private aircraft owner, and one hedged round with restrictions and regulations. There is no likelihood that such restrictions will be very substantially diminished in the near future, at any rate so far as they relate to the airworthiness of the aircraft itself. It is noticeable that private owners generally, however much they may wish to be free from restrictions, agree that a very high standard of construction, maintenance and inspection must continue to be essential. So long as this remains the case, the cost of an aircraft and its upkeep is bound to be comparatively high, and as a sport its popularity is far more likely to be comparable to yachting than to motoring. [This view coincides with that we have always expressed.—ED.]

As at present constructed, it must be admitted that the aeroplane has a very limited value to the private owner except for sporting purposes. The weather in this country is too bad, the distances too short, and the roads and railways too good to make it a practicable proposition for business purposes. Even if the speed were increased to 250 m.p.h., or more, the same drawbacks would still apply unless and until a machine was produced which could not only fly fast, but could also land and take off in a very confined space, which possessed a clear field of view in all directions, and which could be navigated through fog with accuracy and safety.

It may be granted that if all these requirements were complied with—and I do not say that they will not be complied with one of these days—the aeroplane might well come into common use by private owners and its numbers increase to such an extent that air traffic regulation would present a serious problem. It would not, however, be an insoluble one, for the very reason that the great drawbacks at present associated with aerial navigation, which are mainly lack of visibility, lack of accurate means of navigation in thick weather, and lack of the ability to slow down in the air, would all have disappeared. In other words, although it sounds a bit Irish, only the disappearance of the factors which would create the traffic problem would lead to the production of enough aircraft to make the problem a real one.

I am far from suggesting that there is no such thing as an air traffic problem at all at the present day, let alone that such a problem will not exist in the future. There is no doubt that over certain much-used routes private flying must be prohibited or regulated in certain weather conditions. No improvement in the design of aircraft is likely to remove altogether the risk of collision in the air. On the whole, however, it seems likely that the danger will remain proportionately constant, in as much as increased numbers can only come with improvements of design calculated to minimise the risk of collision.

The problem, such as it is, should certainly not be ignored, but to exaggerate it would merely give the C.I.N.A. an excuse to produce a further bulky volume of regulations, with small profit except to we lawyers—and possibly to Mr. Pelman!

ALAN GOODFELLOW.

Manchester.

October 21, 1933.

[2886] Everyone even remotely connected with the development of commercial aviation should give serious consideration to Maj. Mealing's paper as *per* the report in your issue of October 19; also to the article in the same issue, entitled "Private Owners, Are We the Last of Our Race?"

On the issue at stake, "Control of the ever-growing air traffic," one could say, "Leave any decision for the present; the child is yet so young that there is no immediate need to consider his future" (apart perhaps from the very advanced child, Master Croydon); or one could say that "To become a well-mannered adult his education cannot start too soon."

Personally, I favour the latter, provided that the form of education does not entail restrictions until absolutely necessary.

But the problem, risk of collision in the air, is a vital one, and such a problem that the sooner attention is concentrated upon devising ways and means of solving it, the better.

Presumably there is already risk of collision at and near a busy airport like Croydon.

But compare the aerial traffic using that port to the number of boats using the Port of London, or the number of trains in and out of any busy railway terminus.

Unless the possible volume of traffic at any airport can be increased manifold, and with safety, over any figures we have yet before us, commercial aviation economically will be a doubtful proposition. The overheads of the termini and ports of call for limited traffic only would be so severe as to confine that limited traffic to either use by the rich, Government servants, or mails, and, if limited, it cannot serve the community as it should.

Also, every pressure is being brought to bear on municipalities throughout the country to establish airports, (a) to encourage air traffic, and (b) to meet the requirements of this growing traffic. Every form of air traffic, private and commercial, casual or scheduled.

Yet one may have to say that their £30,000-£70,000-£100,000 airport can only deal safely with what is really an infinitesimal amount of traffic, owing to the grave risk of collision in the air. A risk, too, that everyone knows, under present circumstances to be a very real one. One that will retain air travel as something of little real account unless it is solved.

Maj. Mealing is no scaremonger. I hope his lecture will make everyone connected with aviation confess what they must already know, that the risk of collision is going to be the one paramount difficulty that must be overcome before air travel can ever be a major industry.

Many have discussed it in hushed whispers. Maj. Mealing has proclaimed it.

Private owners may feel despondent, but it is gratifying to read in Maj. Mealing's lecture of his appreciation of the problem and his efforts and experiments in meeting it and trying to solve it. It *must* be solved, lest every-day flying by casual people be doomed.

At most airports to-day the idea of increased air traffic being undesirable is almost laughable, but the time will come when it is a difficulty and a danger, so I for one hope that the result of Maj. Mealing's lecture will be that he is assisted in solving his problem by the concentrated energies of the best brains in the aircraft industry as a whole, and so prepare for an unhampered extensive development of flying for every purpose.

RICHARD ASHLEY HALL.

Bristol.

October 21, 1933.



## Autogiro Notes

FLYING continues every day at the Autogiro School at Hanworth, despite the wintry weather. Over 1,000 hr. have been logged since the beginning of the year. Mr. J. Ray, Vice-President of the American Autogiro Company, and test pilot for the Pitcairn Autogiro interests, is at present on a visit to this country, and expressed admiration of the lines along which Autogiro development

[2887] I have read with interest the provocative article by Private Owner, who "dreams in idle moments of the coming of thousands of private owners flying anything from cheap low-power aeroplanes, calling for little skill, up to high-power luxury cruisers for those who could afford them."

If this were likely to be the case, it would emphasise at once in the interests of the thousands of care-free private owners that Maj. Mealing's ideas could only be for their own safety and the safety of others using the air on their lawful occasions.

Turning from dreams to practical realities. I think the next few years, while showing an increase in internal traffic, will not bring about congestion or other serious risk of collision except at terminal aerodromes.

It is possible to run the risk of collision on the surface with a reasonable chance of getting away with it; in the air no such reasonable chance exists, and the thousands of cheap low-power aeroplanes calling for little skill are likely to be more of a menace to Private Owner than he imagines.

Summarising the position, one could say with reasonable certainty that there is no need to confine flying to certain routes except in the case of Continental transport working to and from Croydon, but if and when the time arrives to organise control of internal traffic it will be in the interests of all users of the air, and more particularly Private Owner, who will by then have ceased dreaming dreams in idle moments.

A. G. LAMPLUGH.

London, E.C.3.  
October 23, 1933.

[2888] Maj. Mealing's extraordinarily interesting paper seems to have aroused misgivings about the future of private flying.

I assumed at first, on reading the paper, that everything would sort itself out and there would be time to look after the interests of the other-than-airline aviator, but since discussing the matter with one who is closely associated with this kind of flying, it would seem that there may be a real menace to private flying apart from Maj. Mealing's words.

It goes without saying that air liners should be safeguarded from the risk of collision with other aircraft by every possible means—it is hardly necessary to emphasise that—but it is also extremely important that the necessary regulation does not ignore the needs of other aircraft. The existence of what may be called the private owner market is having a great influence on the design of commercial aircraft and the development of civil aviation, and should continue to do so to an increasing extent. If commercial types remained first cousins to Service types, progress would be much slower. The development of small aircraft in which the utmost return for the horse-power and cost is one of the first essentials has indicated the way to economical flying on the larger scale, and is always producing, in great variety, scale models upon which future commercial aircraft can be based. When, about seven years ago, these developments commenced, there was an immediate and complete divergence from Service designs, the ideas underlying which are different—almost opposite—to those which rule if economy and reliability when remote from skilled assistance coupled with efficient functioning in all climates and in inexperienced hands is wanted. The existence of the private owner market has permitted this development, the pioneering and familiarising of Empire routes, the provision of aerodromes and facilities all over the Empire, and the export of much British material.

There must obviously be ways of safeguarding air liners and at the same time permitting other flying; perhaps eventually providing a private owners' corridor for fogs, but I cannot believe that the interests of this branch of aviation will be entirely neglected.

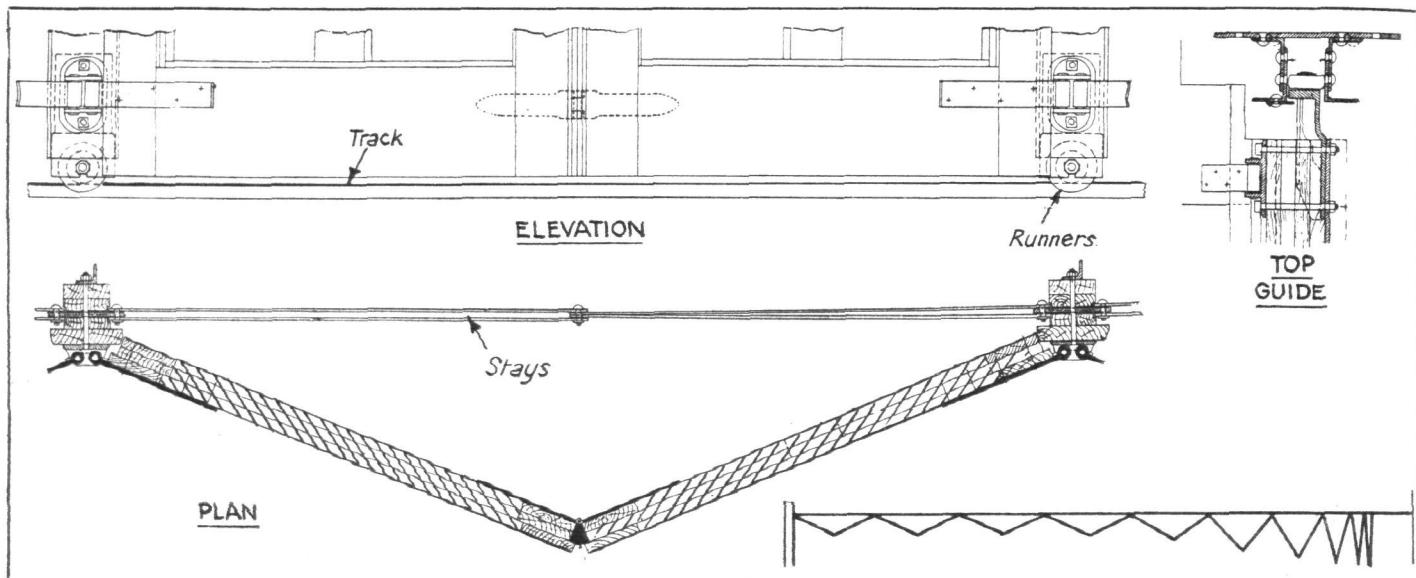
Stag Lane Aerodrome.  
October 23, 1933.

C. C. WALKER.



has been carried out in England. Autogiros over here were, he said, greatly in advance of those in common use in America. The latest C.30 type which, as our readers know, has been built at Heston, with direct control and a seven-cylinder "Genet" engine, cowled with a Townend Ring, has now been flown and has more than fulfilled Señor de la Cierva's expectations. Several orders have been received from abroad for this type.

## ESAVIAN HANGAR DOORS



Sketch showing the principle of the Esavian hangar doors ; above, the construction of one of the units, and, below, the "concertina" method of folding.

BEFORE 1918, the doors of large hangars were, from many points of view, unsatisfactory. Opening and closing were operations usually requiring dexterity and great strength, and often a gale necessitated extensive repairs. In the early part of that year, however, the Educational Supply Association, Ltd., designed and constructed for the Air Ministry a set of doors 25 ft. high, covering an opening 100 ft. in width, which could be opened and closed with surprising ease in all weathers. Some of these "Esavian" doors were fitted to a hangar at a well-known Service aerodrome. Soon after their erection the C.O. reported to the Air Ministry that, as the result of a violent storm, all the hangar doors at the aerodrome, except those of the "Esavian" type, had been blown down! So much for strength.

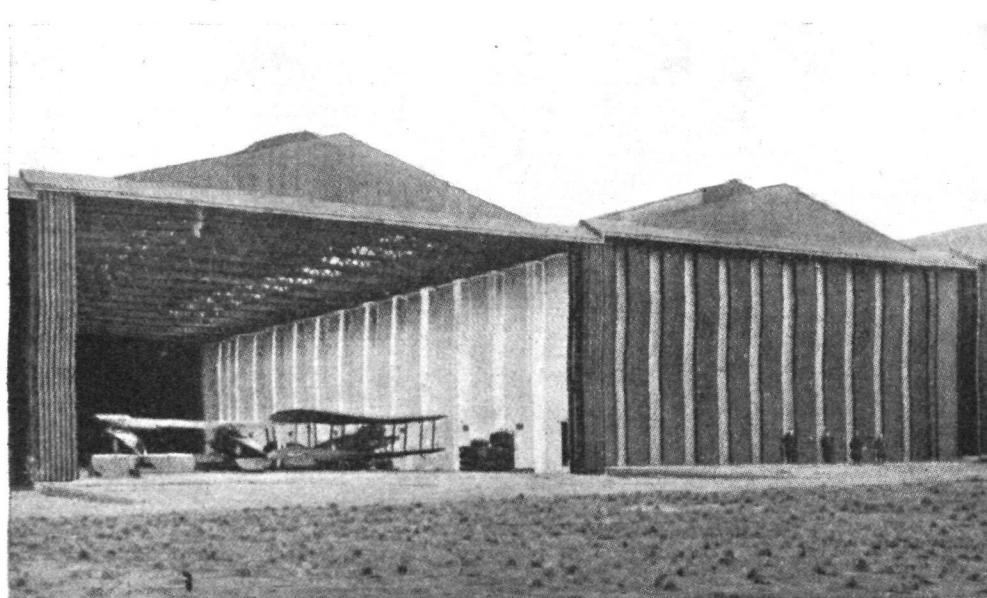
That the doors are durable is proved by the long life of those fitted to the large hangars at Ford Aerodrome. These were installed in 1918. When the Ford Company took over the buildings in 1931 they found them in excellent condition. The 32-ft. doors at Henlow, and those at numerous other R.A.F. stations (over 10 miles of door equipment was supplied in 18 months) tell a similar story. Their use at Heston and Speke is evidence enough of their reputation among modern aerodrome authorities. The

feature which makes these doors of special interest for use at modern civil aerodromes is their ease of manipulation. A set of teak doors, about 19 ft. high, can be opened by one man as fast as he can walk. For larger doors, say 30 ft. in height, a patent winding gear is employed.

The success of these doors must be attributed to the use of the "sliding post" arrangement. This entails the use of a sliding upright, to which is fixed a large bottom runner fitted with ball bearings. This runs on a metal track, and is fitted with twin top guides, also with ball bearings. The leaves, which fold to one side of the track and not across it, are attached to the upright in pairs, as shown in the diagram. The entire weight of the structure is carried on the bottom runners, the top runners acting solely as guides.

The taller types of door are made to stand corrugated against wind pressure, and special stays, shock absorbers, buffers, etc., are fitted. To prevent the doors being opened from the outside, a lever fastener with pawl and plate is fitted. The leaves may be panelled, panelled matchboarded, or part glazed, according to individual requirements. A small wicket is included in the design to act as a passdoor.

The large hangar is by no means the only item on the up-to-date aerodrome to which Esavian doors may be applied to advantage. They are ideally suited to the small "lock-ups," which are becoming increasingly common on aerodromes used by private owners. Esavian windows and "Loggia" type doors are well suited for use on club-house verandahs, while garages, partitions and telephone boxes are a few more items which soon come to the mind.



These hangars, on a Service aerodrome, are fitted with the Esavian folding doors, which are shown both open and folded.



### Imperial Airways Increased Earnings

THE Directors of Imperial Airways announce that, for the year ending March 31 of this year, profits were £52,894, after allowing £171,683 for obsolescence, as

compared with a profit for the previous year of £10,186, when £101,756 was deducted for obsolescence. The dividend is increased to 5 per cent., compared with 3 per cent. of a year ago.

# THE ROYAL AIR FORCE

*London Gazette*, October 17, 1933.  
General Duties Branch

The following are granted permanent commns. as Pilot Officers, with effect from Oct. 7 and with seny. of the dates stated:—A. P. Chamberlain (April 7, 1932); G. L. S. Griffith-Jones (April 7, 1932); Viscount Acheson (Oct. 7, 1932).

F. J. Manning is granted a short service commn. as Acting Pilot Officer on probation, with effect from and with seny. of Sept. 22.

The following Pilot Officers are promoted to rank of Flying Officer:—J. L. H. Fletcher (March 19); S. F. Godden (April 10); J. G. Bigelow (Aug. 6); P. Y. Davoud (Aug. 24) (with seny. of Aug. 5); G. E. Watt (Aug. 28); D. Price (Sept. 3); A. T. Monks (Oct. 8).

Group Capt. R. J. Bone, C.B.E., D.S.O., is placed on half-pay list, scale A (Oct. 15). F/O. N. E. Morrison takes rank and precedence as if his appointment as Flying Officer bore date Dec. 27, 1932. Reduction takes effect from Sept. 5. Wing Com. D. L. Allen, A.F.C., is placed on retired list at his own request (Sept. 26); Flt. Lt. F. V. Beamish is placed on retired list on account of ill-health (Oct. 18). The following Flying Officers are transferred to Reserve, Class A (Oct. 12):—D. H. V. Craig, E. J. Finnegan, T. Gadd, R. P. Garnons-Williams, C. R. J. Hawkins, M. T. M. Hyland, J. O. H. Lobjey, B. A. Oakley, J. D. H. Slade, J. R. Stebbing, A. N. I. Worger-Slade.

Acting Pilot Officer on probation G. H. Jenkinson relinquishes his short service commn. on account of ill-health (Oct. 18).

#### Stores Branch

The follg. officers are transferred to commns. as commissioned engineer officers on probation, with effect from Sept. 11 and with seny. of the dates stated:—F/O. J. T. Brown (Jan. 5, 1931); F/O. T. E. Guttry, M.B.E. (April 19, 1932); F/O. on probation F. G. Hammond (April 20). (Substituted for *Gazette* Sept. 26.)

#### Medical Branch

F.O. F. I. G. Tweedie, M.R.C.S., L.R.C.P., B.Ch., is promoted to the rank of Flight Lt. (Oct. 12).

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified:—

#### General Duties Branch

**Wing Commanders:** J. L. Vachell, M.C., to H.Q., Iraq Command, Hinaidi, 10.10.33, for Air Staff Intelligence duties, vice Wing-Com. R. Graham, D.S.O., D.S.C., D.F.C.; G. H. Bowman, D.S.O., M.C., D.F.C., to Station H.Q., Farnborough, 16.10.33, to Command, vice Wing-Com. F. C. V. Laws, O.B.E.

**Squadron Leaders:** T. A. Warne-Browne, D.S.C., to No. 810 (F.T.B.) Sqdn., 10.10.33, to command, vice Com. E. W. Anstice, R.N., Sqdn.-Ldr. R.A.F. C. K. Chandler, M.B.E., to H.Q., Iraq Command, Hinaidi, 10.10.33, for duty as Chief Signal Officer, vice Sqdn.-Ldr. W. W. Hart, M.B.E. A. R. Churchman, D.F.C., to No. 4 Flying Training School, Abu Sueir, 10.10.33, for Administrative duties, vice Sqdn.-Ldr. C. H. C. Woolver, M.C. S. Graham, M.C., to Aircraft Depot, Iraq, Hinaidi, 10.10.33, for Engineer duties vice Sqdn.-Ldr. G. Martyn, P. G. Scott, to No. 203 (F.B.) Sqdn., Basrah, Iraq, 10.10.33, for Administrative duties, vice Sqdn.-Ldr. J. S. Chick, M.C., A.F.C. C. E. W. Foster, to No. 7 (B.) Sqdn., Worthy Down, 9.10.33, for Flying duties, vice Sqdn.-Ldr. J. S. T. Fall, W. M. Yool, to No. 70 (B.T.) Sqdn., Hinaidi, Iraq, 12.10.33, for Flying duties, vice Sqdn.-Ldr. G. T. Richardson, D. Colyer, D.F.C., to R.A.F. Staff College, Andover, 16.10.33, for duty as Instructor, vice Wing-Com. N. H. Bottomley, A.F.C.

**Flight Lieutenants:** R. Costa, to School of Tech. Training (Men), Manston, 11.10.33. G. R. Beamish, to R.A.F. Depot, Middle East, Aboukir, 10.10.33. J. H. McN. Campbell, to H.Q., Middle East, Cairo, 10.10.33. T. C. Dickens, to R.A.F. Depot, Middle East, Aboukir, 10.10.33. L. G. Harvey, to Aircraft Depot, Iraq, Hinaidi, 10.10.33. A. A. C. Hyde, to No. 2 Armoured Car Co., Ramlech, 10.10.33. N. A. Pearce, to Aircraft Depot, Iraq, Hinaidi, 10.10.33. C. H. Tighe, to No. 45 (B.) Sqdn., Helwan, 10.10.33. K. S. Brake, to No. 32 (F.) Sqdn., Biggin Hill, 13.10.33. I. McL. Cameron, to No. 70 (B.T.) Sqdn., Hinaidi, Iraq, 12.10.33. F. H. A. Harrison, to H.Q., Iraq Command, Hinaidi, 15.10.33. L. P. Moore, to R.A.F. Training Base, Leuchars, 12.10.33. S. J. Smetham, to No. 23 (F.) Sqdn., Biggin Hill, 10.10.33. F. R. Worthington, to No. 4 Flying Training School, Abu Sueir, 12.10.33. W. Badley, to Elec. & Wireless School, Cranwell, 14.10.33. V. B. Bennett, to R.A.F. College, Cranwell, 15.10.33. P. F. G. Bradley, to H.Q., Coastal Area, Lee-on-Solent, 16.10.33. L. W. Cannon, to H.Q., R.A.F. India, New Delhi, 12.10.33. D. D'A. A. Greig, D.F.C., A.F.C., to Station H.Q., Amman, 3.10.33. G. H. Mills, to Aircraft Park, India, Lahore, 22.9.33. T. H. Perry-Kenne, to Station H.Q., Hal Far, 1.10.33. J. M. J. C. J. I. Rock de Besombes, to R.A.F. Base, Malta, 1.10.33. M. V. Ward, to No. 22 (B.) Sqdn., Martlesham Heath, 14.10.33.



#### R.A.F. Memorial Fund

The fourth Council Meeting of the year was held at Iddesleigh House, Carlton Street, London, S.W.1, at 3 p.m. on October 4. Sir Charles McLeod, Bart., Chairman and Honorary Treasurer, was in the Chair. The usual financial resolutions were carried. The Council were informed that grants to the amount of £3,329 19s. had been disbursed since the last Meeting on July 5, 1933.

**Constitution of Council.**—Air Vice-Marshal F. W. Bowhill, C.M.G., D.S.O., Air Member for Personnel takes his place as a Member of the Council. Mr. F. E. Rosher, in accordance with Rule (1) of the Constitution, resigns.

**The Secretarieship.**—Group Captain G. I. Carmichael, D.S.O., A.F.C., assumed duties of Secretary from September 1, 1933, and Mr. J. P. Cunningham resigned his appointment as Assistant Secretary from September 8, 1933. The next Meeting was fixed for Wednesday, December 6, 1933, at the offices of the Fund at 3 p.m.

#### No. 3 Squadron Re-Union Dinner

No. 3 SQUADRON R.F.C. and R.A.F. is holding its Annual Re-union dinner at 7.30 for 8 p.m. on Friday, December 1, 1933, at the May Fair Hotel, London. Air Marshal Sir Robert Brooke-Popham, K.C.B., etc., is Chairman. Marshal of the Royal Air Force Sir John Salmond has kindly consented to be present.



## ROYAL AIR FORCE RESERVE RESERVE OF AIR FORCE OFFICERS

#### General Duties Branch

The follg. Pilot Officers are promoted to the rank of Flying Officer:—P. T. Petley (Sec. Lt., T.A.) (July 10); D. Bevers (Sept. 2); J. T. Percy (Sept. 12); D. R. Ashworth, J. P. H. Balston, A. T. Brock, G. A. Brown, R. E. Collins, K. C. Cooke, J. A. Cope, E. C. Daniels, C. J. Donovan, C. A. H. Evans, W. E. Evans, J. A. Gillies, L. R. D. Hollis, G. S. Hook, R. W. Jones, M. T. Maw, F. W. Moss, L. D'A. Orpen, H. F. Pafin, A. J. Sayer, L. G. Sparrow, G. S. Stead, J. W. J. Truran, J. Vivian, P. D. Walker, S. M. M. Watson, W. R. Wilson, P. B. Wood, F. G. Woodward, R. C. M. Yates, G. P. Harger (Sept. 14); R. G. Grant (Sept. 17); M. F. Peacock (Sept. 21); G. I. F. Thomson (Sept. 22); B. T. Aikman (Sept. 23); H. L. Warren (Sept. 30); R. Cave-Brown-Cave (Oct. 1).

The follg. are transferred from Class C to Class A:—Flt. Lt. G. Rose (April 7); F/O. F. T. K. Bulmore (Oct. 2).

The follg. are transferred from Class A to Class C:—Flt. Lt. P. H. Davy (Sept. 16); Flt. Lt. N. H. Woodhead, D.S.C. (Oct. 1); Flt. Lt. C. T. Holmes (Oct. 8); F/O. M. T. Bromley (Oct. 12).

The commn. of Pilot Officer on probation K. T. Hall is terminated on cessation of duty (Sept. 20).

#### SPECIAL RESERVE

#### General Duties Branch

J. H. Smith is granted a commn. as Pilot Officer on probation (Oct. 18); Flt. Lt. J. F. R. Hunter relinquishes his commn. on completion of service (June 6).

#### AUXILIARY AIR FORCE

#### General Duties Branch

No. 602 (CITY OF GLASGOW) (BOMBER) SQUADRON.—P/O. D. W. Law is promoted to rank of Flying Officer (Sept. 10).

#### Stores Branch

**Flight Lieutenants:** W. Best, to R.A.F. Depot, Middle East, Aboukir, 10.10.33. W. J. Cleasby, to R.A.F. Depot, Middle East, Aboukir, 10.10.33. L. V. Hirst, to R.A.F. Depot, Middle East, Aboukir, 10.10.33. J. W. Mitchell, to Station H.Q., Heliopolis, 10.10.33.

**Flying Officers:** H. C. Adams, to Aircraft Depot, Iraq, Hinaidi, 10.10.33. H. J. Hunter, to Station H.Q., Ramleh, 10.10.33. G. Thornton, M.M., to Aircraft Depot, Iraq, Hinaidi, 10.10.33.

#### Accountant Branch

**Wing Commander** C. P. Ogden, O.B.E., to H.Q., Iraq Command, Hinaidi, 10.10.33, for duty as Command Accountant, vice Wing-Com. J. L. Robertson,

**Squadron Leaders:** J. S. Griffiths, to Station H.Q., Upper Heyford, 17.10.33, for Accountant duties, vice Sqdn.-Ldr. W. G. W. Prall, W. R. Westcombe, to H.Q., Cranwell, 15.10.33, for Accountant duties, vice Sqdn.-Ldr. A. R. Thomas.

**Flight Lieutenants:** H. A. Murton, to H.Q., Iraq Command, Hinaidi, 10.10.33. C. W. Price, to Station H.Q., Ramleh, 10.10.33. W. R. Donkin, to R.A.F. Depot, Middle East, Aboukir, 26.9.33.

#### NAVAL APPOINTMENT

The following appointment has been made by the Admiralty:—

**Lieut. R. W. Wicks** (F/O., R.A.F.), to *Victory*, for R.A.F. Base, Gosport (Oct. 17).



#### No. 207 (Bomber) Squadron

A CORRESPONDENT writes to point out to us that No. 207 (Bomber) Squadron was ordered overseas to Turkey in September, 1922, and was encamped at San Stefano aerodrome outside Constantinople for nearly a year. The squadron was then commanded by Sqn. Ldr. (now Group Capt.) T. C. Tedder, who now commands the Air Armament School at Eastchurch.

#### No. 19 (Fighter) Squadron, Re-Union Dinner

It is proposed to hold a Re-union Dinner in December this year. Past members of the Squadron who would like to attend please communicate with Secretary, 19 (Fighter) Squadron, R.A.F., Duxford, Cambridgeshire.

#### Calshot Re-Union Dinner

THE First Re-union Dinner of the above Station will be held at the R.A.F. Club, London, on Friday, December 8, 1933; Dress, Dinner Jackets. Applications for tickets (12s. 6d. each) accompanied by remittance, should be addressed to Wing Commander H. E. M. Watkins (retired), R.A.F. Base, Calshot, not later than November 15, 1933.

#### Comrades of the Royal Air Force Association

THE Annual Re-union Dinner for all ranks past and present of H.M. Air Forces will take place at the Thames House Restaurant, Millbank, London, S.W.1, on Saturday, November 25, 1933. Tickets, 3s. 6d. each. The president, Marshal of the Royal Air Force The Lord Trenchard, G.C.B., D.S.O., D.C.L., L.L.D., will preside. Tickets, cash with order, from the Hon. General Secretary or Branch Secretaries.

## AIRCRAFT COMPANIES' STOCKS AND SHARES

ALTHOUGH the move to higher prices which developed this month was checked by the withdrawal of Germany from Geneva, there has on balance been a good rise in industrial shares under the influence of the indications that improvement in trade conditions is continuing. Shares of companies connected with the aircraft and allied industries reflected the general tendency and were active at higher prices on the favourable view taken by the market of dividend prospects. Imperial Airways came in for considerable attention on the past year's results, and the increase in the dividend from 3 per cent. to 5 per cent. which were up to best expectations. As compared with a month ago, the shares have risen from 30s. 7½d. to 34s. 4½d., and at the time of writing the tendency is for them to move further in favour of holders in anticipation of Monday's annual meeting. Fairey Aviation had another large rise during the month from 26s. 3d. to 28s. 9d. in response to market views that there are possibilities of a good increase in the dividend, which is not expected to be declared before the middle of December. As the company does not pay an interim dividend, the present price of the shares may be regarded as carrying the whole payment for the year. De Havilland also established a good advance, being 26s. 9d., compared with 23s. 9d. a month ago. In this case the market is looking for a good recovery in profits and a moderate increase in the dividend. Hawker Aircraft, which have a nominal value of 5s., moved up from 14s. 4½d. to 16s. 6d.; and Rolls-Royce, despite the official denial of the market rumour that the company is contemplating a bonus issue of shares, have established a further rise from 62s. 3d. to 70s. 6d. On the basis of the past year's dividend of 10 per cent., the yield on Rolls-Royce units is on the small side, but this has to be considered in relation to the company's strong

Name	Class	Nominal Amount of Share	Last Dividend %	Current Quotation
Anglo-American Oil	Deb.	Stk.	5½	102½
Armstrong-Siddeley Develop	Cum. Pref.	£1	6½	22/6
Birmingham Aluminium Castg.	Ord.	£1	5	32/-
Booth (James), 1915	Ord.	£1	15	68/6
Do. do.	Cum. Pref.	£1	7	28/-
British Aluminium	Ord.	£1	5	29/-
Do. do.	Cum. Pref.	£1	6	24/6
British Celanese	Ord.	10/-	Nil	15/9
British Oxygen	Ord.	£1c	6½	39/4½
Do. do.	Cum. Pref.	£1c	6½	27/6
British Piston Ring	Ord.	£1	20	67/6
British Thomson-Houston	Cum. Pref.	£1	7	28/9
Brown Brothers	Ord.	£1	10	46/3
Do. do.	Cum. Pref.	£1	7½	29/-
Dick (W. B.)	Cum. Pref.	£10	5	117/6
De Havilland Aircraft	Ord.	£1	2½	26/9
Dunlop Rubber	Ord.	c	4	35/4½
Do. do.	"C" Cum. Pref.	16/-	10	28/-
En-Tout-Cas (Syston)	Def. Ord.	1/-	Nil	6/-
Do. do.	Ptg. Ptd. Ord.	5/-	Nil	2/9
Fairey Aviation	Ord.	10/-	10*	28/9
Firth (T.) & John Brown	Cum. Pref.	£1	6D	12/6
Do. do.	Cum. Pref.	£1	5½D	12/6
Ford Motor (England)	Ord.	£1	Nil	23/6
Fox (Samuel)	Mt. Deb.	Stk.	5	82½
Goodyear Tyre and Rubber	Deb.	Stk.	6½	104
Handley Page	Ptg. Pref.	8/-	10	11/-
Hawker Aircraft	Ord.	5/-	B	16/6
Do. do.	Red. Cum. Pref.	£1	B	20/-
Hoffmann Manufacturing	Ord.	£1	5	26/-
Do. do.	Cum. Pref.	£1	7½	26/10½
Imperial Airways	Ord.	£1	5	34/4½
Kayser, Ellison	Ord.	£5	1	65/-
Do. do.	Cum. Pref.	£5	6	100/-
Lucas (Joseph)	Ord.	£1	25E	112/6
Napier (D.) & Son	Ord.	5/-	Nil	7/6
Do. do.	Cum. Pref.	£1	7½	23/9
Do. do.	Pref.	£1	8A	17/6
Petters	Ord.	£1	Nil	7/6
Do.	Cum. Pref.	£1	7½G	13/9
Roe (A. V.) (Cont. by Armstrong-Siddeley Devel., q.v.)	Ord.	£1	—	—
Rolls-Royce	Ord.	c	10	70/6
Smith (S.) & Sons (M.A.)	Def. Ord.	1/-	Nil	4/9
Do. do.	Pt. Pfd. Ord.	£1	7	47/6
Do. do.	Cum. Pref.	£1	7½	24/4½
Serck Radiators	Ord.	£1	12½	42/6
"Shell" Transport and Trading	Ord.	£1	7½*	52/6
Do. do.	Cum. Pref.	£10	5	£11½
Triplex Safety Glass	Ord.	10/-	25	81/10½
Vickers	Ord.	6/6	4	8/3
Do.	Cum. Pref.	£1	5*	22/4½
Vickers Aviation (Cont. by Vickers, q.v.)	—	—	—	—
Westland Aircraft (Branch of Petters, q.v.)	—	—	—	—

\* Dividend paid, tax free. c £1 unit of stock. d Last xd. March, 1931. e Also 100% share bonus.

▲ Last xd. September 1931. b Issued this year. c Last xd. July 19, 1932.

position and good earning capacity and the possibility of a larger dividend for the current year. Petters' issues continued to be held tightly, but have changed hands this month; the preference improved from 10s. to 13s. 9d. and transferred at 14s. S. Smith (M.A.) issues remained firm in anticipation of the annual report which falls to be issued next month. Handley Page preference improved during the month from 10s. to 11s. British Oxygen were very steady on the possibility of a larger interim. Higher prices were made by Napier ordinary and preference. The 8 per cent. preference are out of the dividend list, but as their dividend is non-cumulative, there will be no arrears of dividend to deal with before payments can be resumed on the ordinary shares. Joseph Lucas moved up more than 10s. during the month on the increased dividend and the share bonus of 100 per cent., while the Birmingham price of British Piston Ring also had a substantial advance on the 20 per cent. paid for the past year. Kayser, Ellison were marked up at Sheffield on the resumption of dividends, and Serck Radiators were steady on the past year's results. Oil shares have been rather uncertain, the tendency being to await the Shell announcement as to whether the payment of interim dividends is to be recommended.

## IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.

For 1912 and 1913, see FLIGHT for January 17, 1914.

For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1932 being given in FLIGHT, January 19, 1933.

	Imports		Exports		Re-exports	
	1932.	1933.	1932.	1933.	1932.	1933.
Jan. . .	2,456	2,078	122,942	82,963	863	827
Feb. . .	2,503	9,868	181,482	79,357	90	3,050
Mar. . .	1,946	3,760	167,195	126,008	200	821
April. . .	622	2,236	142,145	121,030	1,128	94
May . . .	1,747	232	138,356	149,214	5	—
June . . .	398	1,021	126,330	137,186	125	2,037
July . . .	1,070	4,806	142,702	75,634	120	2,520
Aug. . .	511	284	111,073	96,368	3	2,000
Sept. . .	2,161	2,091	115,464	140,323	—	710
	13,414	26,394	1,247,689	1,001,153	2,534	12,059

## PUBLICATIONS RECEIVED

Automobile Electrical Equipment. By A. P. Young and L. Griffiths. London: Iliffe & Sons, Ltd. Price 15s. net. By post 15s. 6d.

Sir Henry Royce, Bart., 1863-1933. Rolls-Royce, Ltd., 14-15, Conduit Street, London, W.1.

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AERONAUTICAL PATENT SPECIFICATIONS						
Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)						
APPLIED FOR IN 1932						
Published October 26, 1933						
9,174. HAMILTON STANDARD PROPELLER CO. Adjustable pitch propeller. (399,205.)						
10,725. AKTIEBOLAGET MILO. Prime movers for aircraft. (399,238.)						
27,061. FAIREY AVIATION CO., LTD., and A. G. FORSYTH. Variable-pitch airscrews. (399,313.)						
31,700. B. VOICIECHAUSKIS. Safety devices for air and water craft. (399,332.)						
APPLIED FOR IN 1933						
Published October 26, 1933						
3,996. BENDIX AVIATION CORPORATION. Clutch control mechanism. (399,377.)						
14,966. G. & J. WEIR, LTD. and J. A. J. BENNETT. Rotary blades or wings for aircraft. (399,446.)						
17,719. DORNIER-METALLBAUTEN GES. and C. DORNIER. Aircraft wings. (399,453.)						

# Personals

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## To be Married.

**T**ANNER : CUTHBERTSON.—The engagement is announced between JOSEPH SEYMOUR TANNER, R.A.F., younger son of the late Richard Tanner and Mrs. Tanner, of Southmoor, near Abingdon, and JILL, only daughter of W. R. D. Cuthbertson, late of the Nigerian Civil Service, and Mrs. Cuthbertson, of Pootings, Crockham Hill, Kent.

**G**RINDELL : OAKES.—The engagement is announced between GORDON JOHN GRINDELL, R.A.F., younger son of Mr. and Mrs. J. Grindell, of Timaru, New Zealand, and WINIFRED DOROTHY, daughter of Capt. M. P. R. Oakes, late 5th Lancers, and of Mrs. Oakes, of 10, Wilbraham Place, Sloane Street, S.W.

## Deaths.

**B**EATON.—On October 18, 1933, REGINALD BEATON ("REGGIE") (F/O R.A.F.), younger son of Mr. and Mrs. E. W. H. Beaton, of 61, Sussex Gardens, aged 28.

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**A**P. THURSTON & CO., Chartered Patent Agents, 329, High Holborn, W.C.1. Tel.: Hol. 1117.

**F**J. CLEVELAND & CO., Chartered Patent Agents, 29, Southampton Buildings, London, W.C.2. Telephone: Holborn 5875-6.

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**G**EE & CO. (H.T.P.) Gee Patent Agent for Great Britain, U.S.A., Canada, etc., Mem. Rad. S.G.B., A.M.I. Rad. E.), 51-52, Chancery Lane, London, W.C.2 (two doors from Govt. Patent Office). Phone: Holborn 1525. Handbook Free.

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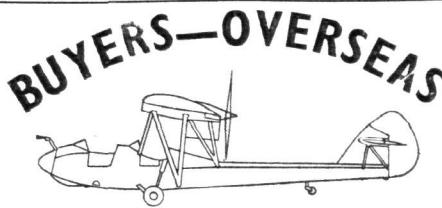
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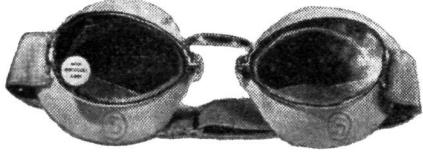
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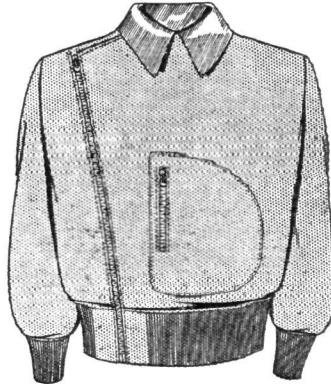
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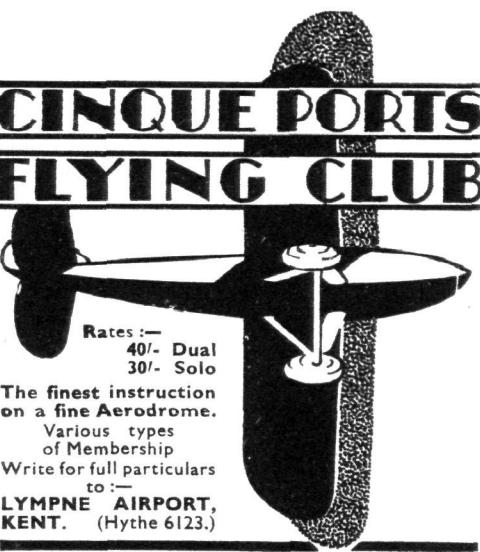
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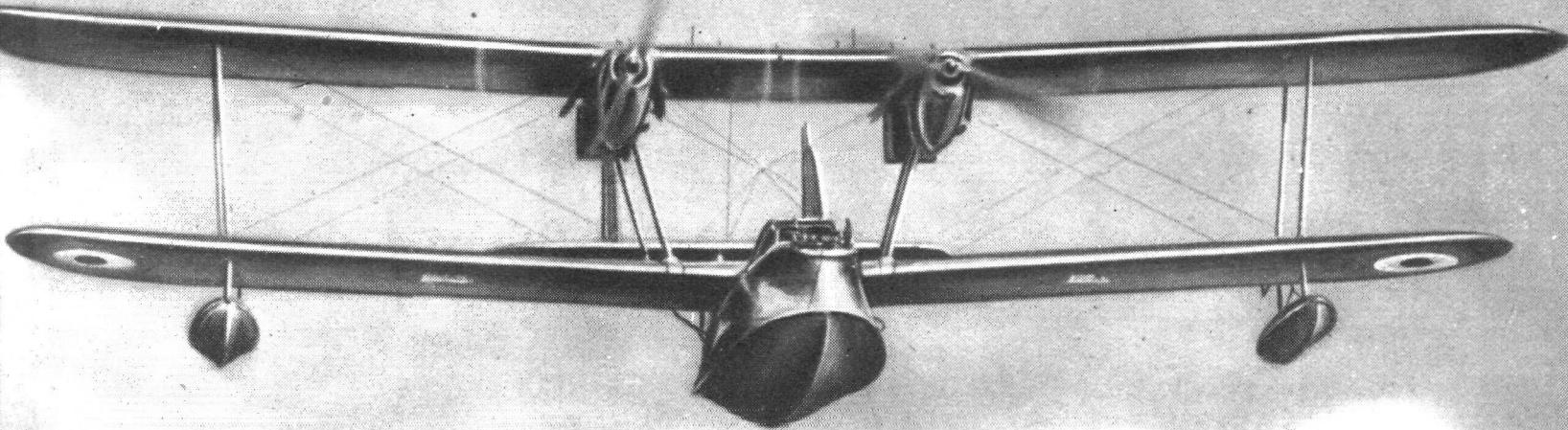
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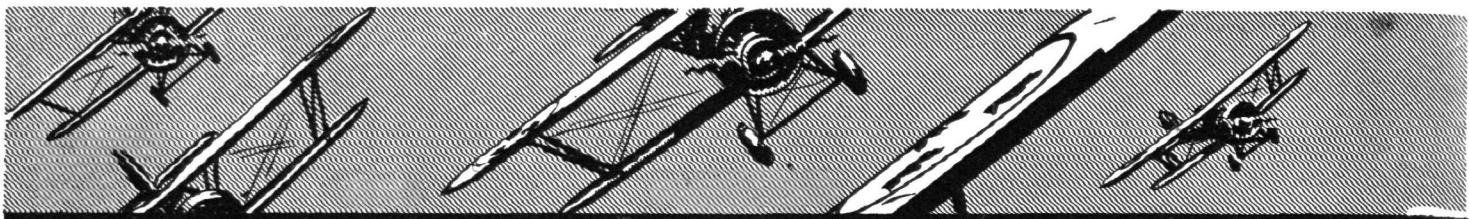
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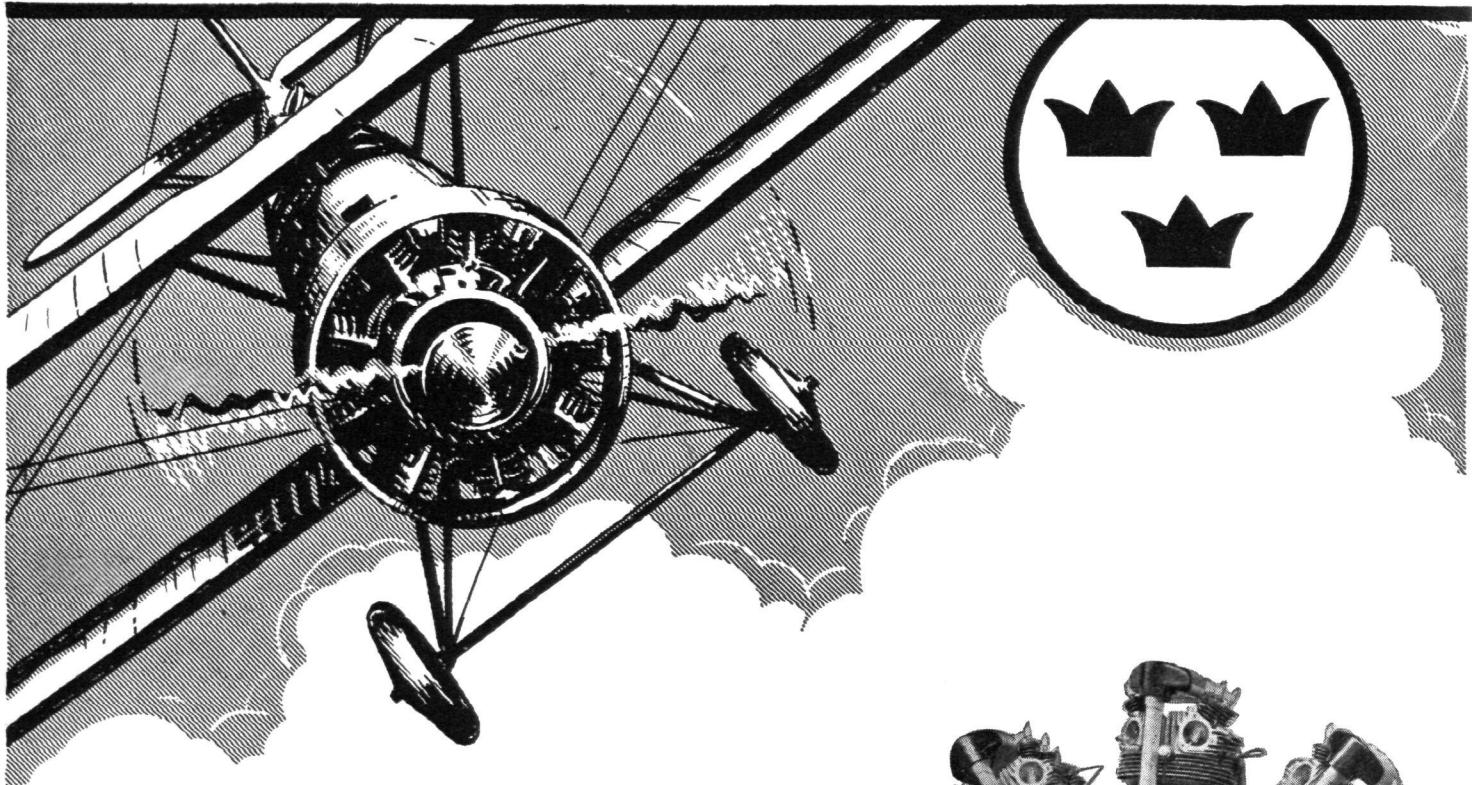


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